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R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXXIV NO. 5

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Spring Mirrors

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VOL. XXXIV WASHINGTON, D. C., MAY 1950 No. 5

Memories of . . .

Gumbo and Gumption

Jeff McDermid

MY Mother and I first saw the clapboard shack on the west Dakota prairie in the late afternoon of a bright day in the fall of 1907—the domicile that sheltered us from strong winds and driving rain and snow for a year and a half of homesteading. Dad had been our forerunner and advance provider, and the reason why he went out there like John the Baptist into the "wilderness" on a mission of his own creating is a separate, but necessary, incident to make the sequel clear. Our coming was a natural result, as there were only two of us left in the immediate family to follow his leadership and honor his hunches.

This time his hunch was an unfulfilled wish to accommodate himself a little financially through recourse to the existing homestead rights and privileges belonging to veterans of former wars. They were not called "GI" benefits in those remote days, nor were their variety and value as generous and tempting as the rewards that are provided for the ex-members of the armed forces today. Moreover, none of the gentler sex were listed among the beneficiaries.

For several years, over his pipe and cider mug, he was wont to relate to us his war experiences and privations; and wind up with a vow to make good some day on his inherent right to acquire a parcel of government land for the small cost of residing on same and plowing a few rods inside the new barb-wire fences. He never expected

to stay through the whole five-year, proving-up period required, but he decided that by staying on the claim for a couple of years they would permit him to obtain full title to a quarter section at the nominal cost of $1.25 per acre.

At his age—66 years—he did not feel like gambling an extra three years to get a deed for nothing. We used to think that all those yearnings and vague proposals were as evanescent and unstable as the blue smudge arising from his bowl of black standard tobacco. But he surprised us the year before I graduated from high school by announcing that he had seen a successful homesteader down at the G. A. R. Post hall lately, and had been "sold" again with a vim to the idea of being an Argonaut to the western Eldorado. This comrade of his was a convincing talker.

So we invited the gent with the data to come out for dinner, and we listened in mingled ardor and gloom to his recital of claim life in Pennington county across the winding Teton river. (Dad's was the ardor, and the gloom and foreboding were from mother and me.) Yet so intriguing and stirring was the narrative of the other enthused war hero that we finally became slightly imbued ourselves with a dash of the infection for adventure that animated Dad.

TRUE, it was quite some radical departure, in more ways than one, for a family used to the tree-clad, rolling hills and alternate marshlands and inlets of flowing rivers, dotted on many sides with clear, blue lakes and olive-green willow colors in spring and ruddy variegated hues in autumn. Our own country was as dear to us as it had been to our grandparents and their close neighbors, the Winnebago Injuns, who "saw God in clouds and heard him on the winds." Like them, we saw no pressing need to traipse out west into the dun-colored vastness of waving grass, haunt of the once-proud buffalo and the fiercer tribes of Oglalla Sioux.

But, still and all, it was something to ponder over during the school recess and to look forward to as a chance to prove the truth of those dog-eared dime novels alive with cowboys and callow tenderfeet. Besides, I was young enough to make up for the combined age of my parents, and my eyesight and my endurance must meet the test.

THERE would not, of course, be any great change in temperature extremes by our migration due westward on the same parallel, but the high and dry plateaus and uplands, minus frequent natural waterways, bounded on the top by the clouds and the stars, and fringed on all sides with vibrating mirages and brown endless, treeless distances, would be indeed a change of scene. The drier atmosphere was guaranteed by our informer to banish colds and seeping sinuses and impart a leather-toned and shiny complexion to any outdoor sojourner in that realm.

Little explanatory comment was made by our mentor about the slightly inconvenient and dismal disadvantages of existence on a claim in a makeshift shack, frequented by field mice and prey to other night vermin that penetrated the mattresses. Nor was it said that our rude shack would be exposed to the brilliant sun, whose rays scorched and bent the tar-paper roofing. The small detail of good well-water was glossed over too, a point I paid for later by lugging sploshing pailfuls a mile or more from the nearest neighbor's claim, on a neck-yoke device, while the voracious mosquitoes bedeviled my face and hands as I stumbled through the bunchgrass. These mosquitoes were likewise unexpected in a region almost without any visible breeding pools of stagnant water. They, like the occasional horned toad and the frequent prairie-dog town and owl habitation, seemed to defy all rules for sustenance.

But nevertheless, we went. Dad preceded us by several months. My first duty in the interval was to finish high school and arrange for someone to stay

in our eastern home while we endured the western fever. I had planned to leave my dog, Major, with them too; but he broke away the night Mother and I left with our trunks and boxes, and appeared at the depot platform about fifteen minutes before the old "pioneer limited" was due to pick us up. So I had a friend in the baggage car to look after and feed and exercise at junction stops and transfer points. As a matter of fact, Major gave me less worry and anxiety than my Mother,

whose none-too-robust health was in a dither and a stew as we rode all those weary miles by day coach and overland Concord stage, eating the somewhat crumbly and greasy lunch that good friends provided as a fond farewell. Major's only mishap was a fall from the side of the open baggage doorway at one station stop, where he hung by the leather collar until rescued by the attendant. Otherwise he enjoyed the change of scenery and proved to be a consoling companion on many prairie hikes, where he flushed up gray larks and snuffed at gopher holes.

Our journey by rail through Fort Pierre westward included a river ferry across the Missouri and more rattling travel out to the Northwestern's current terminal at Philip, where we stayed over night in a hostelry that was a reminder of old Virginia City days—all bunks full of construction crews. The next day we boarded a six-horse stage to jump the gap to Wasta, from whence the line of rails extended to Rapid City through the little town in the cottonwood "draw" that was our trading-post and post-office.

This lumbering Deadwood type of coach and its laconic driver thrilled me no end. Only two summers before I had seen the dramatic stage coach robbery enacted by Sioux Indians at William F. Cody's own side-walled circus and historic pageant, where the famous Annie Oakley shot on the wing from a prancing broncho. The coach we rode in was exactly like it, and no tenderfoot ever had a worse case of tension and elation than myself, perched beside the driver up front, with Mother, Major, and the trunk and pine boxes careening along behind in the baggage "boot"—across virgin prairies and over steep fords where the chances for quicksand in the Bad river's bed was pointed out luridly by the driver.

Nothing serious happened to the baggage, except that at one stop I hastened to the rear to look things over and found that a fork had jabbed through a crack in the box board. I pulled it on out and stuck it in my vest pocket—a handy weapon to have if we were ambushed by Sioux and had to resist scalping.

I KNOW that my green exterior and my graduate-class suit and stiff "derby" hat, layered with alkali dust, must have been a great temptation to our jehu to josh me and initiate me to the ways of the West. He was not very communicative, but all his brief answers were tuned to the occasion, including the hint that homesteaders were interlopers who had stacks of hostility awaiting them from the old-time ranchmen and cow-punchers, who hated furrows and fences because they wrecked the range.

Loyal as I remained to my Dad's devoted ideal, this slant on the expedition gave me some inner misgivings. Yet the vastness of the grassy seas we were traversing emboldened me to reply that there appeared to be ample room out there for more beef and wheat than the country could easily consume. This sage forecast was made long before any government price supports and acreage allotments were in the cards.

But he was a standpatter. Perhaps

(*Turn to page* 48)

Physical Soil Factors Governing Crop Growth

By R. Earl Storie[1] *and Walter W. Weir*[2]

California Agricultural Experiment Station, Berkeley, California

PLANTS differ greatly in their growing and rooting habits. Some will extend their roots deeply into the soil when they are given the opportunity; others not so deeply. In general, annual crops are more shallow-rooted than perennials, and there is a definite correlation between the size of the plant and the extent of its root system. In general, if a plant has sufficient depth and volume of soil in which to extend its roots to the full extent of its habitual traits, it will be a better plant than if the root system is restricted in any way.

The productive capacity of a soil and the physical features which are conducive to maximum yields should be judged by their ability to produce a wide variety of useful plants rather than a single crop which because of environmental conditions may make it highly desirable and profitable. There are certain physical characteristics of an all-purpose, highly productive soil that make it distinctive.

[1] Soil Technologist.
[2] Drainage Engineer.

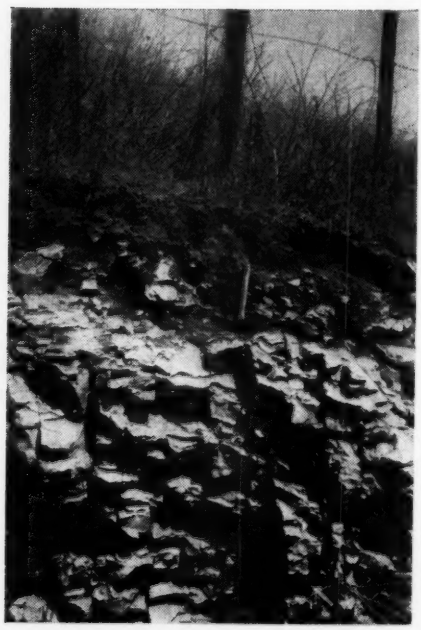

Fig. 1. Shallow upland soil. Profile-Group VIII. Plant growth is limited by volume of soil.

Soil Depth and Permeability

No single physical characteristic of a soil is quite so important or is reflected so prominently in both quantity and quality of plant growth as depth. In other words, the amount or volume of permeable soil that a plant has to grow in to a large extent determines its size and quality. Alluvial soils which have been deposited so recently that they have undergone no significant changes in profile development will be found to be the most conducive to plant growth. The shallow depth of many upland or primary soils or the imperviousness of many of the older terrace soils greatly restricts the amount of soil that a plant may explore for moisture and nutrients. (Figs. 1. 2). The lack of soil volume can in a measure be overcome by improving the growing conditions through the application of moisture, fertilizer, and the best management, but the same effort placed on a deep, permeable soil would be even more productive of results.

Deep, permeable alluvial soils are inherently more fertile and more productive than claypan and hardpan soils for the reason that the natural processes of weathering which have de-

Fig. 2. Shallow soil. This land should be utilized for grazing as there is insufficient depth of soil for orchard. Profile-Group VIII.

veloped these subsoil conditions have leached the soil of much of its plant nutrients at the same time that they reduced the depth or quantity of soil available to plants.

Soils may be classified on the basis of their profile development or, if you please, of their depth and permeability. This is exactly what has been done in Storie's profile-groups.[1], [2] The first five of these profile-groups contain secondary soils which progressively become shallower and more dense and impervious in the subsoil. This is always accompanied by conditions less favorable to plant growth.

Profile-group I. Soils on recent alluvial fans, floodplains or other secondary deposits having undeveloped profiles underlain by unconsolidated material. These profiles show no accumulation of clay in the subsoil resulting from the downward movement of particles from the surface horizon.

Profile-group II. Soils on young alluvial fans, floodplains or other secondary deposits having slightly developed profiles underlain by unconsolidated material. These profiles show slight compaction or slight accumulation of clay as the result of leaching from the surface horizon.

Profile-group III. Soils on older alluvial fans, alluvial plains or terraces having moderately developed profiles underlain by unconsolidated material. These profiles have moderate accumulation of clay in the subsoil as the result of the continued movement of particles from the surface horizon.

Profile-group IV. Soils on older plains or terraces having strong accumulations of clay in the subsoil underlain by unconsolidated material (Fig. 3). These are claypan soils in which the pans are relatively near the surface and very slowly permeable to the downward movement of water.

Profile-group V. Soils on older plains and terraces having hardpan subsoil layers, usually underlain by unconsolidated material. These rock-like hardpan horizons may be lime, lime-iron, or iron cemented and do not soften or disintegrate in water (Fig. 4). They are the result of the downward move-

[1] Storie, R. Earl. Index for rating the agricultural value of soils. Bul. 556, California Experiment Station, Revised 1937.

[2] Storie, R. Earl, and Walter W. Weir. Manual for identifying and classifying California Soil Series. Associated Students' Store, Berkeley, 1948.

Fig. 3. Soil having very dense claypan in subsoil which is very slowly permeable to water movement. Profile-Group IV. Roots do not easily penetrate this claypan.

ment of the cementing materials from the surface horizon.

Profile-group VI. In addition to the five groups of secondary soils, there are a few older terrace and upland soils having dense clay subsoils resting on moderately consolidated, usually unrelated materials. From a physical standpoint these soils are the least desirable for plant growth.

There are also three groups of upland or primary soils, as follows:

Profile-group VII. Soils on upland areas developed in place by the weathering of hard, acid, or basic igneous rocks.

Profile-group VIII. Soils on upland areas developed in place by the weathering of hard consolidated sedimentary rocks (Fig. 1).

Profile-group IX. Soils on upland areas developed in place by the weathering of softly consolidated sedimentary rocks.

The primary soils usually occupy rolling to steep topography and may vary in depth as the result of erosion or other soil-forming factors.

It may be readily seen that permeability of secondary soils is closely related to the depth of material available for root development and plant growth. The more impermeable a soil is to the movement of water, the more restricted becomes the area into which roots will penetrate.

Soil Texture and Structure

Soil texture probably is the next most important physical characteristic of soil in its effect on plant growth. By texture is meant the fineness or coarseness of the individual soil grains and the proportion of each that makes up the soil mass. Clays have the smallest sized grains and sands the largest. The most ideal texture is a mixture of all sized particles such as occur in loams.

Structure is a term expressing the arrangement of the individual soil grains and aggregates such as crumby, cloddy, columnar, granular, etc.

Heavy or fine-textured soils in which a large proportion of the grains is clay size are dense and less permeable to moisture, air, and roots, but have a high moisture-holding capacity. Because these soils take up moisture slowly, they also give it up slowly and they remain wet for a long time. As they dry out they become hard and seldom make what is considered a desirable seedbed. Clay soils may, however, be fertile and contain relatively high amounts of plant nutrients because as the soil particles break down and release these elements, they are not easily leached out of the soil.

Clay soils may be improved and made more friable by the addition of large amounts of organic material. The structure of clay soils can be changed by the application of lime, which promotes the accumulation of the individual soil grains into granules. Granular structure improves the permeability of the soil to take moisture and roots. Excessive quantities of lime should not be placed on soils which

are expected to produce crops which prefer a neutral or acid condition.

Light or coarse-textured soils contain a large proportion of the sand sized grains. These are readily permeable to water and plant roots, but their moisture-holding capacity is low and they give up their moisture rapidly and soon dry-out. Plant nutrients are usually lower in sands than in clays because as these elements are released through weatherng they are more readily leached out of the soil mass.

Sandy soils may also be improved by the addition of organic matter such as barnyard manure and cover crops. Soils thus treated are improved in water-holding capacity, and they retain inorganic fertilizers longer before they are leached out by excessive drainage.

Medium textured soils—loams, silt loams, fine sandy loams, etc.—make the most desirable medium for plant growth. They are permeable enough so that plant roots have little difficulty in penetrating; moisture and air can enter in sufficient quantity and rapidly enough for plant requirements, and leaching is not excessive.

The depth and texture of a soil are permanent soil characteristics that are not changed by the addition of organic matter, lime, and other amendments or fertilizers. Such additions, to a limited degree, alter the structure; and to a somewhat greater degree, overcome some of the limitations imposed by lack of depth and extremes in texture.

Fig. 4. Shallow hardpan soil. Profile-Group V. Adapted only to growth of shallow-rooted plants.

Soil Factors That May be Modified by Management

There are several other soil characteristics which have their influence on crop growth; and although under some particular circumstance, anyone of them may dominate the entire pro-

Fig. 5. The coastal plain claypan soils of California (Profile-Group VI) constitute some of the most erosive soils of the State. This land should be protected from erosion because it causes damage to the valuable valley land in the foreground made up of Profile-Group I soils.

ductivity picture, they are subject to modification by soil-management practices. These factors may include slope and erosion, drainage, alkali, low nutrient levels, micro-relief, and acidity.

Slope and erosion. Soils may be too steep to be farmed by methods usually employed in this country, or erosion may become a serious problem on soils of only moderate slopes. Under virgin conditions sloping soils are protected from excessive erosion by their native vegetation, but when the cover is removed through cultivation or grazing, erosion may be accelerated.

Steep slopes usually occur on primary and upland soils of shallow depth where runoff is excessive and the volume of soil is not adequate to produce a large or vigorous plant. Erosion may be excessive on claypan terrace soils where the volume of soil is limited by the nearness of the pan to the surface and the soil has neither the water-holding capacity nor the space for root development that is necessary for quantity production (Fig. 5).

Drainage. Soils which contain free water, that is, water in excess of that which they will normally hold against the force of gravity, are said to be poorly drained or to have restricted drainage. There may be a number of causes for this condition. Slope is important in drainage. If a soil lies on a flat or level position, so that excess water will not flow away or there is some strata in the subsoil that restricts the downward movement of water, it may become poorly drained. Plants do not grow satisfactorily in a saturated soil. High water table restricts the area of soil with the most suitable moisture condition for root development and has the same general effect of reducing the depth of soil.

In soils having a high water table, air movement through the soil is reduced and plant growth restricted on this account. For the best growth conditions, a soil should be moist but not saturated. Upland or primary soils lie on slopes of sufficient steepness to permit rapid surface runoff of excess water and therefore these soils seldom become waterlogged. In many soils the installation of drains to carry off the excess moisture will prove to be profitable.

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Fig. 6. This is a deep, permeable soil of Profile-Group I that rates 100% by the Storie-Index and is highly productive for orchards and many truck and field crops. Every effort should be made to maintain the high fertility of this soil.

Fig. 1. Lespedeza sericea and Autauga reseeding crimson clover in an Alabama pecan grove. Left to right: Ralph Johnston, chairman of out-of-state tours of Houston, Texas, Chamber of Commerce; H. Owen Murfee, Jr., secretary-treasurer, Autauga Reseeding Crimson Clover Association; C. L. Breedlove, Autauga county agent; and Gen. R. C. Kuldell, chairman, agriculture committee, Houston Chamber of Commerce.

Reseeding Crimson Clover Adds New Income for the South

By James A. Naftel

Agronomist, Pacific Coast Borax Co., Auburn, Alabama

RESEEDING crimson clover is expected to be a key crop in the changing pattern of Southern agriculture. This new crop fits into the year-round grazing program which offers great hope for raising the farm income through better balanced crop-livestock farming.

The search for a thoroughly dependable and satisfactory annual winter clover for the South has been under way for many years. An ideal clover should be easily established, make good vegetative growth, and produce ample seed. Crimson clover has been grown in certain sections of the South for some time and has produced large yields of forage and seed. In much of the South, especially on the less fertile and sandy type soils, it was difficult to obtain good stands and growth of crimson clover. Tennessee formerly grew about 35,000 to 40,000 acres and produced two-thirds of the entire seed crop in the United States. Autauga county, Alabama, alone expects to have 35,000 acres of reseeding crimson clover next year.

Farmers are familiar with the germination of shattered crimson clover seed after each rain in the summer. Periods of drouth in summer and early fall generally caused a complete loss of the seedlings. There was little possibility

Fig. 2. Reseeding crimson clover on Cahaba sand on the farm of Wadsworth Brothers, Prattsville, Alabama.

of volunteer stands of crimson clover living through these hot dry periods. This difficulty could be overcome by developing hard-seeded strains which would not germinate as early in the summer as the ordinary crimson clover.

Thanks to agronomists of the Agricultural Experiment Stations in Alabama, Georgia, North Carolina, and the U. S. Department of Agriculture, superior strains of crimson clover have been developed with sufficient hard seed to be dependable for reseeding. These improved strains are Auburn and Dixie, and after several years' trial they have continued to prove their reseeding ability. Several observant farmers, seeing the future possibilities of reseeding crimson clover, have located and developed other superior strains, namely Allen, Hardy, and Thornton in Georgia, and Autauga and Watson strains in Alabama. These hard-seeded selections have made it much more certain to obtain good stands even with adverse weather. Farmers are finding them thoroughly dependable year after year in establishing volunteer stands.

Reseeding crimson clover may contribute to farm income in three ways: (1) As a winter-grazing crop, (2) as a seed crop, and (3) as a soil-building crop. All of these features fit into the changing pattern of Southern farming. Combinations of crimson clover with small grains, grasses, and summer legumes such as lespedeza sericea are proving highly successful for livestock grazing. Cash returns from the seed crop of Auburn, Autauga, and Dixie have amounted to more than $100 per acre during the last few years. Demands for certified and known origin reseeding crimson have increased greatly. The soil-building quality of the crop results not only in a protecting cover for the soil when rainfall is high in the South but also in adding organic matter and nitrogen to the soil.

Adaptation of reseeding crimson clover is probably more widespread than was that of the ordinary strain, since the hard seed insure stands in areas such as the sandy coastal plains of the Southeast, formerly regarded as unsuitable for this crop. The older established crimson clover areas were the Piedmont section of northeast Alabama, Georgia, the Carolinas, and Virginia, together with considerable areas

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Alfalfa—Its Mineral Requirements and Chemical Composition*

By Firman E. Bear and Arthur Wallace[1]

Soils Department, Agricultural Experiment Station, New Brunswick, New Jersey

ALFALFA has long been recognized as an outstanding hay plant, in terms of both yield and feeding value. It is high in digestible protein, minerals, and vitamins (Table I). Because of its long life, it can be economically produced. It is of exceptional value in maintaining soil fertility. It helps control erosion, improves the physical condition of the soil, and accumulates large amounts of nitrogen (N)[2].

Acreage Moving East and South

Forty years ago, 88 per cent of the alfalfa in the United States was being grown in Kansas, Nebraska, and the states from Colorado westward (Fig. 1). In 1919, 78 per cent of the acreage was in that region; in 1927, 64 per cent; and in 1944, only 44 per cent. In contrast, only 5 per cent of the nation's 1909 alfalfa acreage was in Ohio, Iowa, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Missouri, North Dakota, and South Dakota. But in 1919, these states contained 14 per cent of the acreage; in 1927, 28 per cent; and in 1944, 41 per cent. Likewise, the areas devoted to alfalfa in the eastern and southern states have greatly increased. About 3 per cent of all cultivated land in the United States is now devoted to this crop.

New Jersey grew 1,400 acres of alfalfa in 1909, 26,000 in 1929, and 74,000 in 1945 (Fig. 2). The area now devoted to this crop constitutes about 25 per cent of the hay acreage in the state. Alfalfa should be better adapted to the soils of the northern part of the state than to those in the southern part. Some of the soils of the northern area have been derived from limestone and have natural pH values that approach neutrality.

But, because of the difficulty of keeping a stand for more than a year or two, many New Jersey farmers are no longer attempting to grow alfalfa. A survey of 31 well-distributed fields of the crop showed that the soils in many of them were not fertile enough for alfalfa, they did not contain enough available potassium (K), and they had not been adequately limed.

Alfalfa Has Very High Mineral Requirement

Although alfalfa, like all other plants, is made up mostly of carbon (C), hydrogen (H), and oxygen (O), it requires large amounts of mineral nutrients. A good crop removes calcium (Ca) equivalent to 400 pounds

TABLE I.—SOME FEEDING VALUES OF ALFALFA, RED CLOVER, AND TIMOTHY.

	Protein*	Carotene*	Calcium†	Phosphorus†
	per cent	*ppm.*	*per cent*	*per cent*
Alfalfa	18	50	1.44	0.24
Red clover	15	30	1.20	0.18
Timothy	10	24	0.28	0.15

* Standards for excellent hay.
† Average values.

* This is a reprint of New Jersey Agricultural Experiment Station Bulletin 748, January 1950.

[1] The authors wish to thank S. D. Gray, Northeast Manager of the American Potash Institute, for many helpful suggestions during the course of this study, and the Institute for partly financing the work.

[2] The first time an element or compound is mentioned, both the name and the symbol or formula may be given. In subsequent cases, only the symbol or formula may be shown.

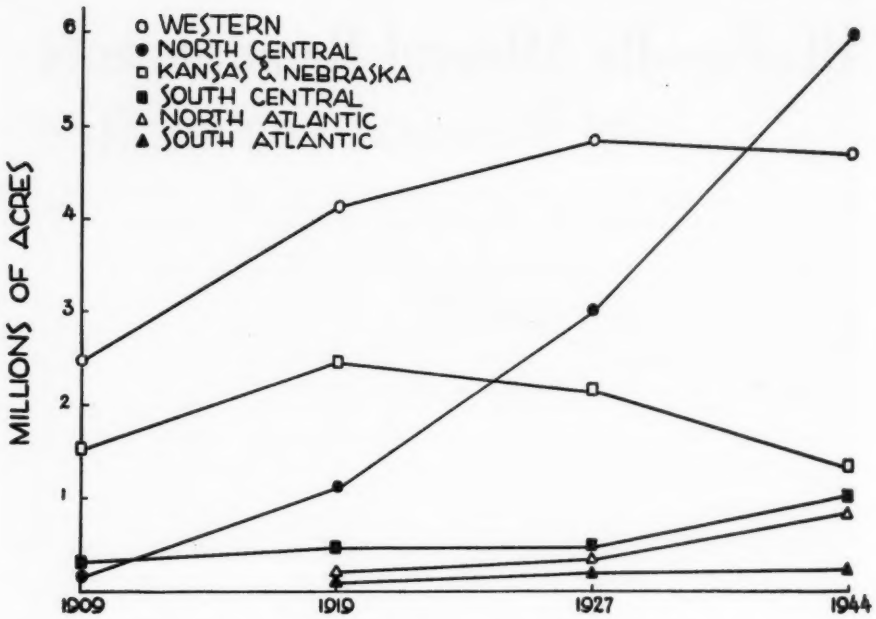

Fig. 1. Alfalfa acreage is increasing in humid regions of United States.

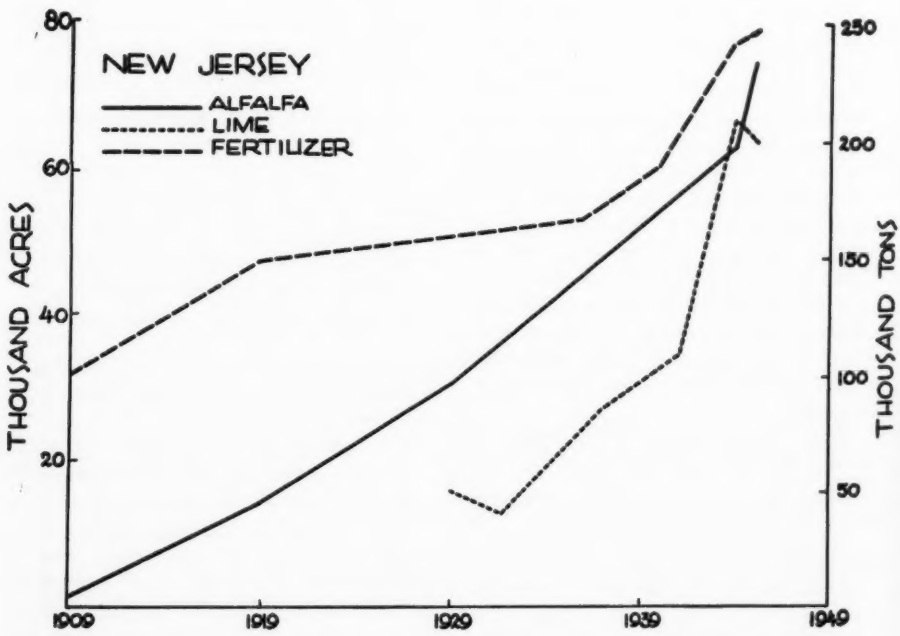

Fig. 2. Alfalfa acreage in New Jersey has grown in almost direct ratio to increased use of lime and fertilizer.

pure limestone ($CaCO_3$) an acre annually from the soil, and an equal amount may be lost by leaching. It frequently contains more than 2 per cent K, on the dry-weight basis (Fig. 3). More K is removed from the soil by a good crop of alfalfa than is usually returned to it, even when liberal use is made of fertilizers. Large amounts of phosphorus (P), magnesium (Mg), and sulfur (S), and appreciable quantities of such minor elements as boron (B), manganese (Mn), zinc (Zn), and molybdenum (Mo) are taken out of the soil by this crop. Alfalfa also requires iron (Fe) and normally contains aluminum (Al), sodium (Na), chlorine (Cl), and silicon (Si). Success with alfalfa in the humid areas of the United States is determined largely by the natural fertility of the soil and the extent to which supplemental liming materials and fertilizers and the necessary minor elements are applied in preparation for seeding and during the period of growth.

The natural habitat of alfalfa is a semiarid, alkaline, calcareous soil. Early attempts to grow this crop in New Jersey failed because the fundamental importance of lime was not understood. Wing says that alfalfa roots "seem to actually like to touch calcium carbonate." Good results with this crop in humid areas are most likely to be attained if the soil has been raised to a high level of fertility by good soil management and if liming materials have been used regularly for a number of years preceding the date at which it is seeded.

Field Study of Plant's Needs Undertaken

Because of the importance of alfalfa to the dairy industry, combined field, greenhouse, and laboratory studies were inaugurated to evaluate the several soil-

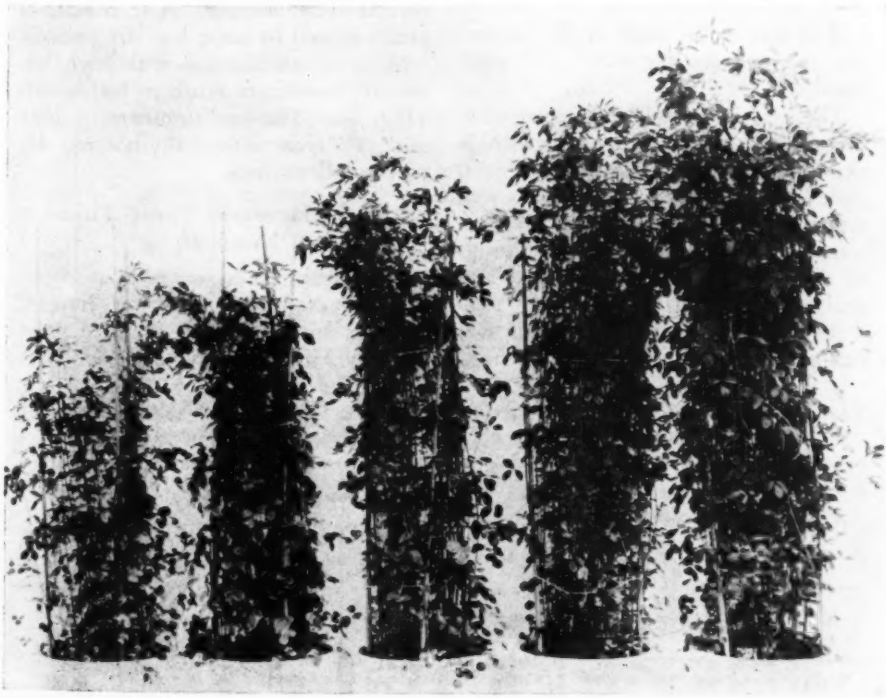

Fig. 3. Importance of potassium is indicated by these plants grown in sand culture. From left to right, the plants contained 0.55, 0.81, 1.19, 2.39, and 3.35 per cent K respectively.

plant factors involved in successful production of this crop.

The field area under experiment was 600 feet long and 64 feet wide, and contained about ⅞ acre. It was sown to clover and timothy in the spring of 1941 and remained in these crops until the summer of 1944, when it was plowed, prepared, and seeded to alfalfa. As the drouth of that summer prevented a successful stand, the area was plowed again in the spring of 1945, kept free of weeds during early summer, and reseeded in early August.

Pulverized calcitic limestone was applied to the entire area at the rate of 1½ tons an acre before the 1944 plowing. An additional 2 tons of the same kind of limestone were used before the 1945 spring plowing. A 5-10-10 fertilizer was broadcast with a grain-fertilizer drill over the entire area at the rate of 600 pounds an acre after the soil had been prepared for seeding in 1944. In preparation for reseeding, in August 1945, an application of 600 pounds 5-10-10 was made, after which the area was sown to Ranger alfalfa. A good stand was obtained.

The soil on which this experiment was located is Nixon loam, which is akin to Sassafras loam but overlies red shale. The area is level and well drained. In the summer of 1946, a composite sample containing 30 borings of the Ap horizon was collected and analyzed (Tables II and III).

At seeding time, the entire area was treated uniformly, except for two sets of triplicated plots. One of these sets of plots received an extra 240 pounds each of potash (K_2O) and phosphoric acid (P_2O_5) an acre. The other set was seeded to timothy, at the rate of 3 pounds an acre, at the time the alfalfa was sown.

TABLE II.—CHEMICAL COMPOSITION OF NIXON LOAM ON EXPERIMENTAL PLOTS.

Constituent	Per Cent	Constituent	Per Cent
SiO_2	83.4	K_2O	0.88
Al_2O_3	4.8	Na_2O	0.40
Fe_2O_3	2.6	CaO	0.36
O.M.*	3.2	MgO	0.23
N	1.2	P_2O_5	0.11

* Organic matter.

The annual rainfall in New Jersey is about 45 inches. This is distributed fairly uniformly throughout the year, except for short periods during autumn (Fig. 4). The mean annual temperature is about 52.7° F. The climate is characterized by some hot, dry periods, which, in combination with high humidity, sometimes result in leaf scorch (Fig. 5). The late summers of 1948 and 1949 were abnormally hot and dry at New Brunswick.

Plots Harvested Three Times Annually

The plots were harvested at one-tenth to one-half bloom stage on June 6, July 18, and September 15, 1946; June 11, July 23, and August 25, 1947; June

TABLE III.—PH VALUES AND CATION-EXCHANGE CAPACITY OF AND EXCHANGE CATIONS IN THE SOIL ON WHICH ALFALFA WAS GROWN.

Depth	pH	Exchange Capacity	Exchangeable Cations*				
			H	K	Ca	Mg	Na
in.		*me.*	*me.*	*me.*	*me.*	*me.*	*me.*
0–6	6.56	7.50	0.76	0.14	5.80	0.78	0.02
6–12	6.40	9.55	0.49	0.21	7.45	1.31	0.09
12–18	7.05	8.60	0.01	0.18	7.11	1.21	0.09

* me. per 100 gm. soil. See footnote 4 for factors to translate me. values into percentages.

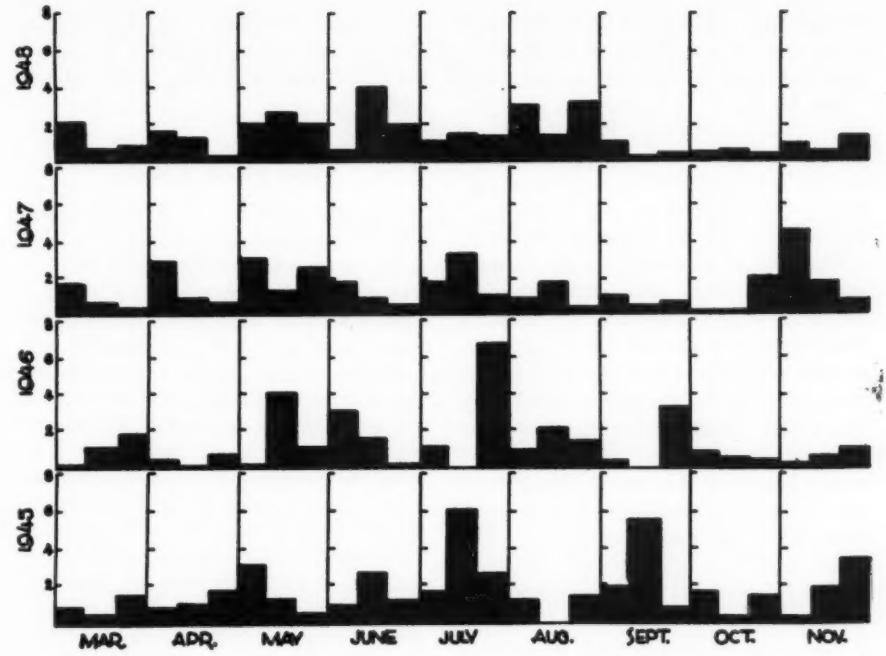

Fig. 4. Distribution of rainfall in inches by 10-day periods throughout the growing season in New Brunswick.

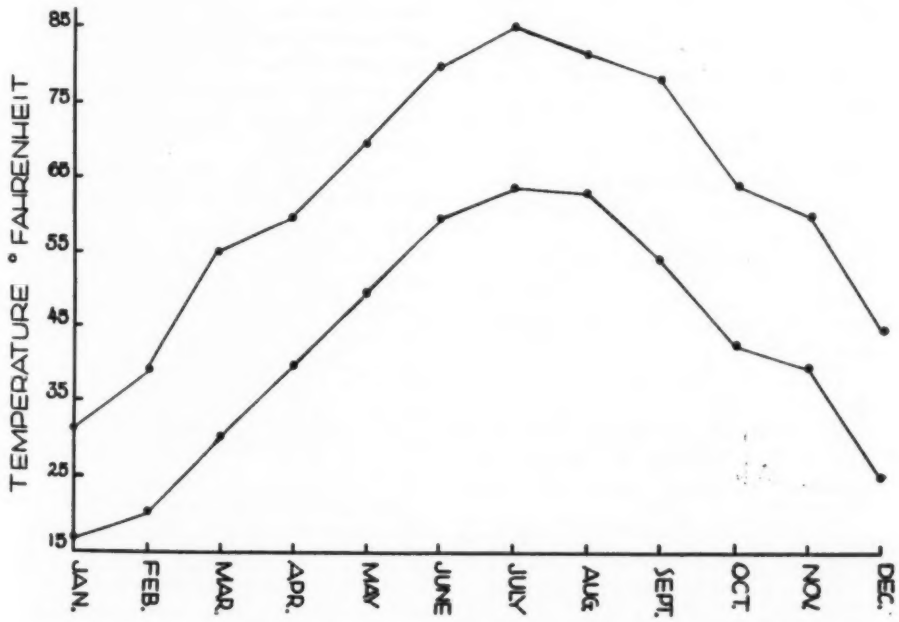

Fig. 5. Mean monthly minimum and maximum temperatures for New Brunswick.

10, July 16, and August 30, 1948; June 6, August 5, and September 10, 1949. The harvested-for-record portions were 5 feet by 43.56 feet, an area of 0.005 acre. The swath was weighed on a portable platform-scale in the field. A sample for moisture was taken simultaneously, weighed on a Toledo scale, and dried in a forced-draft gas oven.

The entire area was finally mowed and the mowings were removed from the plots so that no leachings of plant nutrients from the alfalfa went back on the soil. Fertilizer topdressings, as indicated by the outline (Table IV), were made in early spring, or as soon as possible after the first or second crop [3] had been harvested. Except for plot 5, these topdressings were not begun until the spring of 1947. The yields obtained are reported in terms of pounds oven-dry matter an acre. As air-dried hay normally contains about 10 per cent moisture, that percentage would have to be added to the weights recorded to make them comparable to ordinary field results.

Samples of alfalfa for chemical analyses were obtained the day before harvesting. One stalk from each of 20 plants was selected at random throughout the center portion of each plot. Leaves were removed from stems, and the two portions were weighed separately. The samples were dried at 70° C. in a forced-draft oven and then ground. They were analyzed for N, K, Ca, Mg, Na, P, S, Si, Fe, Mn, B, Cl, and Mo by standard laboratory procedures. All other minor elements were determined by spectrographic procedures.

The K, Ca, Mg, and Na contents of the plant material were calculated to milliequivalents per 100 gm. dry tissue. The N, P, S, Cl, and Si contents were similarly calculated from the milliequivalent weights of the nitrate (NO_3), phosphate (H_2PO_4), sulfate (SO_4), chloride (Cl), and silicate (SiO_3) ions.[4]

[3] At the beginning of the experiment, it was assumed that only two crops would be harvested annually, but it was found possible to remove three crops every season.

[4] These values can be converted to percentages by multiplying the me. K by 0.039, Ca by 0.020, Mg by 0.012, Na by 0.023, N by 0.014, P by 0.031, S by 0.016, Cl by 0.0355, and Si by 0.014.

Liberal Fertilization at Seeding Gave Good Results

The use of 500 to 1,000 pounds of 5-10-10 fertilizer at seeding time has given good results with alfalfa in New Jersey. Application of such large amounts of K has been criticized because it may result in luxury consumption at the expense of Ca and Mg. But large enough applications must be made to ensure a good start for the plants before winter begins.

In this experiment, plots receiving 2,500 pounds of 0-12-12 fertilizer an acre at seeding time in 1945 produced 760 pounds more hay an acre in 1946 than those to which only the standard 500 pounds of 0-12-12 had been applied. At the time of the second and third cuttings of the first year, the alfalfa in these heavily fertilized plots was several inches taller than that on the rest of the field. Late in fall, this alfalfa was growing much more vigorously than that on the rest of the field. In 1947, the yield of these heavily fertilized plots was much higher than that of any other set of plots, although the others had received fertilizer topdressings during that crop season.

During 1948, the stand of alfalfa on these heavily fertilized plots was maintained in good condition without additional fertilizer, even though the plants showed signs of K deficiency. The yields on these plots would probably have been much larger that year if they had received supplemental K prior to 1948. But soil tests revealed that not all of the K that was applied at seeding had been removed from the soil by the end of 1947.

Lack of K was the most serious limiting factor on yield in this experiment (Table V). Although 120 pounds K_2O an acre were applied to the soil during a period of a little more than

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Potassium Cures Cherry Curl Leaf

By A. R. Albert

Soils Department, University of Wisconsin, Madison, Wisconsin

RECENT trials in Door County, Wisconsin, have shown that potassium, when supplied to sick cherry trees, either in a fresh straw mulch or in commercial fertilizers, will cure sour cherry curl leaf. Since straw is usually scarce and relatively expensive, high-potash fertilizers undoubtedly will be more generally used in the prevention and cure of this malady of fruit trees in Door County's "Cherryland."

Soil on Wisconsin's "thumb" is of limestone origin. Some of it is as little as six inches deep over the Niagara bedrock. This is not enough soil to grow general farm crops dependably, because such thin soils are "pumped dry" too rapidly. Besides that, during some four-score years of cropping, many such soils, and deeper ones as well, have been quite thoroughly impoverished. Although such shallow soils are not the best of orchard land either, it seems that cherries are the best crop yet discovered for them.

The underlying bedrock is more or less fissured and cherry tree roots have more time than field crop roots to seek and find these cracks and make use of the moist soil in them. However, if no fissures occur near enough to where some trees were set, those trees are doomed at middle age, and earlier if severe drouth overtakes them, regardless of the fertility level of such thin soils.

First symptoms of cherry curl leaf are an upward curling of leaf edges accompanied by bronzing which later develops into scorch or necrosis that progresses inward from the leaf edges. Terminal twig growth is greatly reduced; in severe cases, none is made. Defoliation of the upper branches of larger trees is common in mid-summer. These conditions are readily mistaken for effects of drouth. After a few seasons of struggle to maintain themselves, trees begin to die—some without ever bearing any fruit. Curl leaf is aggravated by dry soil conditions and seems more prevalent in cultivated than in sodded orchards. It is estimated that about 75 per cent of the cherry trees show curl leaf and about one-third of these are severely afflicted.

One cherry orchard at North Bay (near Ephraim) had been set out in 1942 on one-time farm land in shallow Miami loam soil. Five years later it had produced little fruit, some trees already had been replaced, and many more were slowly dying. Most of them had severe curl leaf, and the owners had become resigned to abandoning the orchard.

They consulted Dr. J. D. Moore, who in turn conferred with the writer. Moore had been unable to attribute curl leaf to any disease organism or insect pest, but had observed that a good straw mulch prevented curl leaf development on young trees and believed that potash in the straw might have helped these trees. However, mulch does several things:

1. It prevents cultivation under the trees and consequent injury to surface feeding roots.
2. Soil is kept cooler and moister in summer and warmer in winter.
3. Fresh straw supplies plant nutrients, especially potassium.
4. Under mulch the soil comes alive with biological activity.

Which of these was most responsible for the observed reduction of curl leaf?

To answer this question for practical application by cherry growers, a fertilizer trial was indicated. Ten treatments, each on 27 trees and in 3 replications, were applied during the fall of 1947. Fertilizer treatments were broadcast over the whole soil area covered by 9-tree plots at 1,000 lbs. per acre, but more heavily around the trees. Fertilizers were cultivated in lightly and then straw mulch treatments were applied on some plots at about 50 to 60 lbs. per tree and 6 to 8 inches deep. In spring, 1948, a ladino clover cover crop was sown all over and all cultivation stopped thereafter. Nitrogen treatments were continued every spring on all trees at conventional rates after 1947, just as previously.

The first season after treatment was exceedingly dry, and all mulched trees showed considerably more improvement in health than trees which were only fertilized. Untreated trees continued their struggle to live. Some trees died, even on treated plots, because they had become too weak to recover under the dry soil conditions of 1947-48.

Rainfall during the second 12-month period after treatment was nearly normal, and marked improvement resulted from several fertilizer treatments. Mulched treatments had gained a start and held those gains. Value of the several treatments was determined in July, 1949, from three independent workers' ratings of all trees, one by one, into one of four classes according to remaining degree of affliction with curl

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Fig. 1. No treatment.

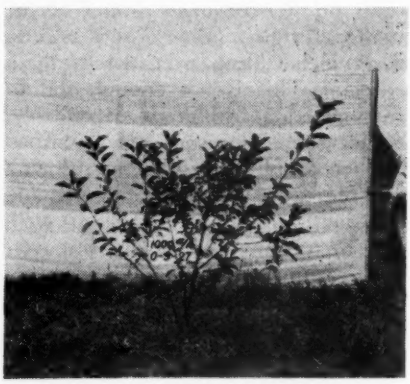

Fig. 2. Fertilized with 1000#/A of 0-9-27.

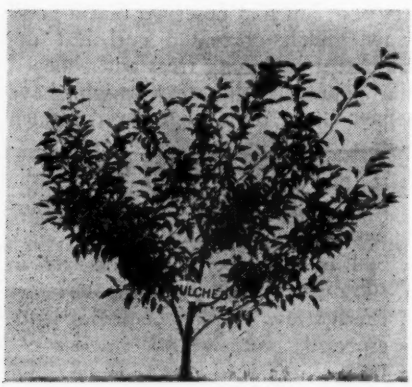

Fig. 3. Mulched.

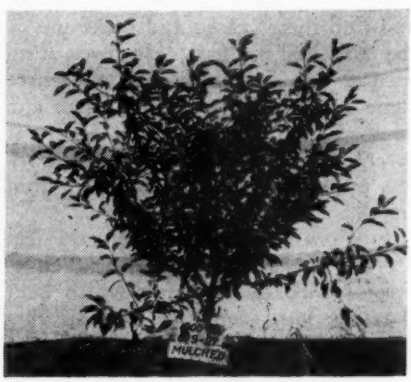

Fig. 4. Mulched plus 1000#/A of 0-9-27.

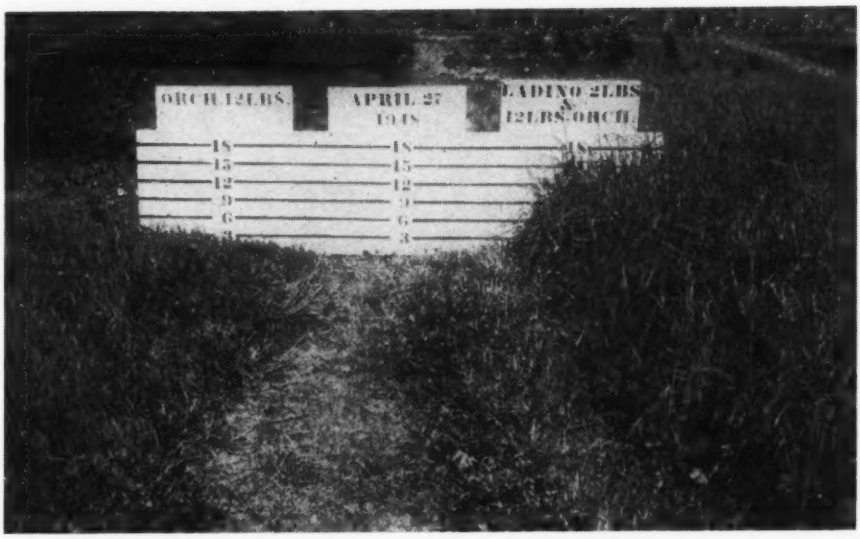

Fig. 1. Orchard grass alone (left) and orchard grass with ladino clover (right) are compared. Both plots were fertilized, maintained, and mowed in the same manner.

The Production and Utilization of Perennial Forage in North Georgia

By Orien L. Brooks

Mountain Experiment Station, Blairsville, Georgia

THE yield records that have been obtained with pasture and forage plants in north Georgia can be more fully appreciated with a brief review of the area as background. This is especially true of the high production obtained with perennial plants such as ladino clover and tall fescue.

Elevation averaging around 2,000 feet, normal rainfall of nearly 60 inches, and a mean temperature in the mid-fifties all encourage better production as it relates to grassland agriculture in the Mountain area of Georgia and the Southeast. As a rule, however, many of the soils, when unfertilized, are deficient in phosphate to the extent that this element is very often a limiting factor. Lowland soils are more commonly deficient in potash but often show combined deficiencies of phosphate and potash. Liming, in all cases when soils have not been previously treated, is a practice that is highly economical with the major crops in the area. Good response is usually obtained from the use of nitrogen on all of the grass crops on most any soil type.

Species study on legumes ranging from alfalfa, trefoils, red clovers and

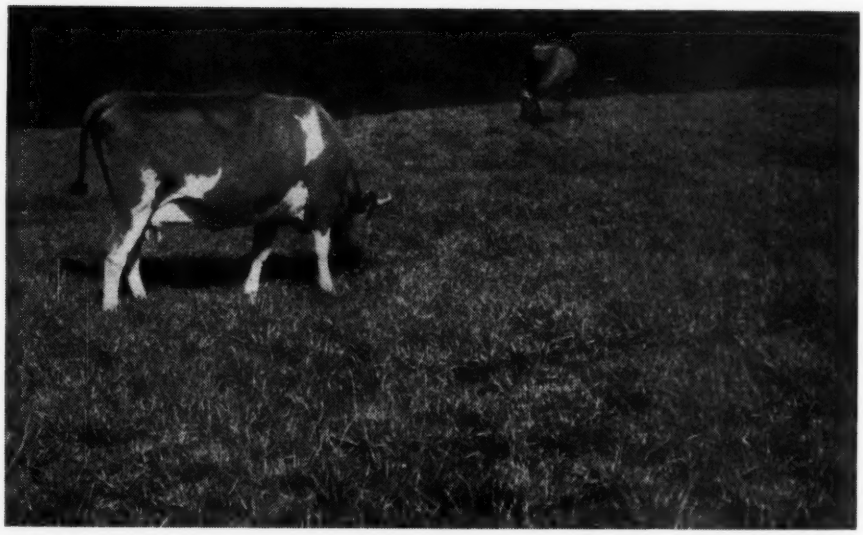

Fig. 2. Winter grazing on a pure stand of alta fescue.

white clovers and grasses, including bluegrass, herds, orchard, and tall fescue, have been conducted. Ladino clover and tall fescue have given best results, as a legume-grass mixture, of all the species and varieties tested. Alfalfa here, as in other sections of the country, is rather expensive and difficult to maintain. Ladino clover and orchard grass when used as hay will give yields comparable both in amount and protein content to alfalfa, and this mixture is much easier to maintain. An average of three years' yields has shown that from early spring to early fall ladino will very nearly furnish the nitrogen required to keep the grass producing at a high level.

Results with trefoil, both the birdsfoot and major lotus or big trefoil varieties, have been very promising as to yield and protein production. However, Rhizoctonia has made it very difficult to manitain a stand. Results with red clovers have been disappointing, too, due to diseases.

Ladino clover is the superior variety of white clover and has been the most persistent legume to give high yields of maximum quality.

Ladino clover is an excellent legume for hay or grazing mixtures. It will withstand many days of 20° temperature, but one day as low as 15° terminates grazing from this clover until the weather is warm enough for growth recovery. About the same is true of orchard grass, making a mixture of these two plants very desirable for hay production, but they offer very little for winter grazing during colder periods. The quick recovery made by ladino after mowing, grazing, and cold injury does make it the most desirable perennial legume. This clover increases both yield and protein of tall fescue.

The yields from Alta and Kentucky 31 fescue have shown very little practical difference either in test plots or

TABLE 1. YIELD RESULTS OF WHITE CLOVERS, 3-YEAR AVERAGE

Variety	Seeding rate per acre	Yield per acre	Protein content*
	pounds	*pounds*	*per cent*
White Dutch..	4	2,718	26.6
Dixie White...	4	4,223	25.6
Ladino.....	2	5,815	26.6

* Analyses by K. T. Holley, Chemist, Georgia Experiment Station.

TABLE 2. COMPARISON OF TALL FESCUE VARIETIES AND ORCHARD GRASS FORAGE PRODUCTION, EARLY SPRING TO EARLY FALL, 3-YEAR AVERAGE

Plant	Seeding rate per acre	Yield per acre	Protein content*	Total protein produced per acre
	pounds	*pounds*	*per cent*	*pounds*
Alta fescue	12	2,437	16.7	409.9
Kentucky 31 fescue	12	2,286	15.9	363.4
Orchard grass	12	2,487	17.3	430.2

* Analyses by K. T. Holley; seasonal average by cuttings.

under grazing. Both varieties are susceptible to Helminthosporium net blotch and Rhizoctonia and respond equally to fertilization. Both are drought and cold resistant and produce seed and forage at practically the same rate.

It is very interesting to note the excellent increase in forage that is obtained when ladino is mixed with the above three grasses.

It is imperative that production of orchard and ladino or fescue and ladino be utilized either by mowing or grazing as the forage is produced in hot, rainy periods. One of the quickest ways to eliminate ladino from a mixture is to allow the grass to mat down on the clover during the summer. Cross-fencing or division of larger areas into paddocks is one of the best ways to assure continued high production of a fescue and ladino mixture. Even then, with the practice of rotational grazing, hay should be mowed during lush periods of growth. All of the above figures represent production from early spring to early fall. By allowing growth to accumulate during early fall, it can be held in reserve for the coldest periods of winter. It should be utilized by February 1, however, to allow new growth. Ladino affords high carrying capacity until the temperature goes below 15°F. Fescue will remain in good grazing condition through temperatures below 0°.

The expense of establishing a pasture of fescue and ladino is no more per acre on soil of average fertility than is annually seeded small grain, crimson clover, and ryegrass. This mixture offers hay, grazing, and seed production

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TABLE 3. COMPARISON OF TALL FESCUE VARIETIES AND ORCHARD GRASS WHEN GROWN IN MIXTURE WITH LADINO CLOVER. FORAGE PRODUCTION, 3-YEAR AVERAGE

Mixture	Seeding rate per acre	Yield per acre	Protein content*	Total protein produced per acre
	pounds	*pounds*	*per cent*	*pounds*
Ladino clover &	2			
Alta fescue	12	9,093	21.2	1,927
Ladino clover &	2			
Ky. 31 fescue	12	8,775	21.1	1,842
Ladino clover &	2			
Orchard grass	12	7,927	18.7	1,482

* Analyses by K. T. Holley; seasonal average by cuttings.

Fertilizers Help Make Humus

By R. E. Stephenson

Soils Department, Oregon State College, Corvallis, Oregon

SOILS are put under cultivation to obtain economic returns from crop harvests and not primarily to improve the fertility. Not only does tillage operate to speed the decomposition of organic matter and loss of fertility that has accumulated over the ages past, but nutrients are removed in the harvested crops.

The situation is not helped by the too often completely bare fields left to leach and sometimes to erode through the long winters. A lifetime of such practices may seriously impoverish the soil and sometimes results in complete destruction. Prevention is much easier, quicker, and less expensive than to effect a cure for the trouble after the damage is done.

In proportion, as the destructive processes are allowed to go on, yields drop, sometimes to 50 per cent or less of the virgin capacity of the soil to produce. Sooner or later the farmer finds it necessary to use commercial fertilizers and to adopt other good practices, the response from which depends, among other things, upon how well he provides for humus renewal at the same time.

The tendency in developing a fertilizer program is to apply fertilizer to the cash crop, which is good, and to neglect to fertilize the soil-improving crop, which is bad. This seems to indicate that soil conservation and improvement are frequently inadequately evaluated. There is no other explanation for the much waste land and land of low productivity which now exist.

Humus renewal, so important to maintaining the soil at a high production level, usually receives verbal approval, but too often nothing is done about it. The unused straw some of which is burned, the rotting heaps of manure wasting their fertility for lack of someone to spread the material on the soil, the bare fields sometimes cut with gullies, all are evidences of unwarranted neglect. No plant material should ever be destroyed or wasted when it can be returned to help save and enrich the soil.

Humus contains those materials that were present in plants. The bulk of all plant material is organic, built up principally from those elements (carbon, oxygen, and hydrogen) coming from air and water. Only a small portion, 5 to 10 per cent, comes from the minerals of the soil. These relationships in no wise minimize the importance of the soil in its capacity to support plants and provide them with the necessary 11 or 12 elements that help to make good harvests.

When humus is taken apart to get an insight into its make-up and to learn why it functions as it does, some pertinent disclosures are brought to light. The material designated as lignin, present in varying amounts in the plant materials that go into the soil, makes up an important part of the humus complex, perhaps 40 per cent of the total. Protein material, found in all plants and in the cell tissue of the organisms of the soil, is also an important constituent of humus. There are some celluloses, hemicelluloses, fats, resins, waxes, and other things, all of which are found in plants.

Since all these things are organic, they are all subject to decomposition and will ultimately disappear from the soil unless there is regular renewal. Lignin and protein, which Waksman believes enter into a semi-stable combination as the "humus-nucleus," persist longest. The amount of humus in the soil, therefore, is considerably influenced by both the kind and the amount of plant materials which regularly return to the soil.

The materials for humus renewal may be placed in three groups. The most important humus materials are the residues of whatever plants are grown. These include root systems, stubble, leaves, vines, stalks—whatever portion of the plant is unharvested and is allowed to return to the soil. The residue of organic matter left from some crops is large, from others small, sometimes nearly negligible. The sod crops with profuse root development and the legumes with large, deeply penetrating roots contribute most to humus renewal.

The cover crop to be used as a green manure is another means of humus renewal important in some types of farming, particularly orcharding. The contribution from green manures includes both roots and tops, and the amount of growth is quite variable depending upon soil fertility, type of plant, and general management practices. Two tons of top and one of root system are not impossible, but the production is more often under this amount. Such material, because of its easy decomposability, is especially important in contributing to the active humus.

Not infrequently, there is a voluminous growth of volunteer weeds, just as valuable for humus renewal as the more commonly accepted cover crops. In spite of the usual effort to keep weeds under control, the soil is full of weed seeds ready to germinate and grow profusely at the first opportunity. They are not entirely a nuisance, and on rare occasion may be seeded purposely for providing a cover crop. Mustard provides an excellent cover crop and green manure and sometimes is purposely seeded.

Stable manure, though frequently not sufficiently abundant to cover much area, is both a fertilizer and a means of humus renewal of excellent quality. A prominent farmer recently remodeling his system of farming to include a dairy business gave as his major reason the desire to improve his soil. For soil improvement, dairying is a sound business, scarcely equalled by any other type of farming that can be followed. Soil-improving sod crops and legumes are needed and there is abundance of manure made from good feed, some of it purchased, to bring fertility onto the land.

With all these good practices there is an important place for commercial fertilizers. The organic gardeners do not so much overvalue humus renewal as they unjustly undervalue and villainize the use of mineral fertilizers. The elements which mineral fertilizers supply are exactly the same kind as those already in the soil and the same as those in the organic materials. They function in the same way in the nutrition of both plants and animals. They are no more poison than those elements which nature placed originally in the soil. They simply come in a convenient form to be bagged and transported to the field and introduced into the soil as needed to make better plant growth and more profitable harvests. There is no other way to place something in the soil not already there but to bring it in from some convenient outside source—as in a fertilizer bag.

Fertilizers are effectively used to grow soil-improving crops for humus renewal. The plant knows no difference in the nitrogen, phosphorus, potassium, or other element provided by the fertilizer and that provided by the soil or by some form of organic material. The elements are used in the same way by the plant and thus become a part of

the organic matter whatever their source. The important thing is to provide whatever is needed by the plant to make good growth.

Bulk growth is necessarily of prime importance in humus renewal. Few things will contribute as much to bulk growth as properly chosen and wisely used commercial fertilizers. On an orchard cover crop of barley and vetch in Oregon, where the unfertilized yield was three-quarters of a ton or less per acre of dry material, the yield was brought to one and one-half to two tons and sometimes more an acre with commercial fertilizer. For increasing the growth of cover crop, nitrogen stood first in importance, phosphorus second, and potassium third, and some source of sulfur is important on legumes. How much better to have two tons rather than one ton or less returning to the soil for humus renewal.

A nice feature of the use of fertilizers on soil-improving crops—a cover crop or an established sod—is that the fertilizer is converted into organic combinations by the growing plants, thus preventing loss of fertility. When the growth is returned to the soil to make humus, the slow rotting process provides a gradual liberation and continuous flow of available nutrient for the root system of the crop that is produced for an economic return. Fertilizing the orchard by the cover crop route is an accepted practice and it gives good returns.

Fertilizers cause no harmful effects when rightly used on the soil. Among the inexperienced in the use of fertilizers the question is sometimes asked, "Does commercial fertilizer poison the soil?" "No!" is the definite answer to the question.

Essentially the same question, differently formulated, sometimes appears, "Isn't the use of commercial fertilizer like a shot in the arm, a substitute for sound practices of soil management—a stimulant, the effect of which soon wears off and which must always be repeated in ever increasingly large doses to be effective?" Again the answer is "No." Only in the same way in which the animal must be regularly fed in order to get results. The use of fertilizer is a practical and effective means of feeding plants and must be practiced whenever plants are produced and according to the specific need of the plant under the conditions existing where the plant is grown. This is not forgetting the importance of adequate moisture to enable the plant to utilize the fertilizer that is applied.

To depend upon fertilizers alone would be as inadequate as to depend upon humus alone for maintaining soils. Fertilizers provide essential nutrients, but a good soil must have physical properties that permit the plant to develop a root system that functions to withdraw water and nutrients through surface contacts between root and soil. The nutrients and water must be passed on and distributed throughout the plant. Poor crop yields are not infrequently caused by lack of root systems and lack of functioning of the roots to withdraw the needed water and nutrients from the soil. Back of the lack of functioning roots is a soil with physical properties that are unsuited.

Before roots function properly, the soil structure must be such that waterlogging does not occur easily and air as well as moisture must circulate and become available to the root system. A favorable porous, granular structure permits rapid removal of carbon dioxide given off in the soil and just as rapid renewal of the oxygen supply. To develop and maintain this kind of structure, renewal of the humus with soil-improving crops including deep-rooted legumes is the most effective treatment that can be given. The best aeration that a porous structure can afford, and that is consistent with a good moisture supply, is most favorable to plant growth and most helpful in making the use of fertilizers effective in feeding the crop.

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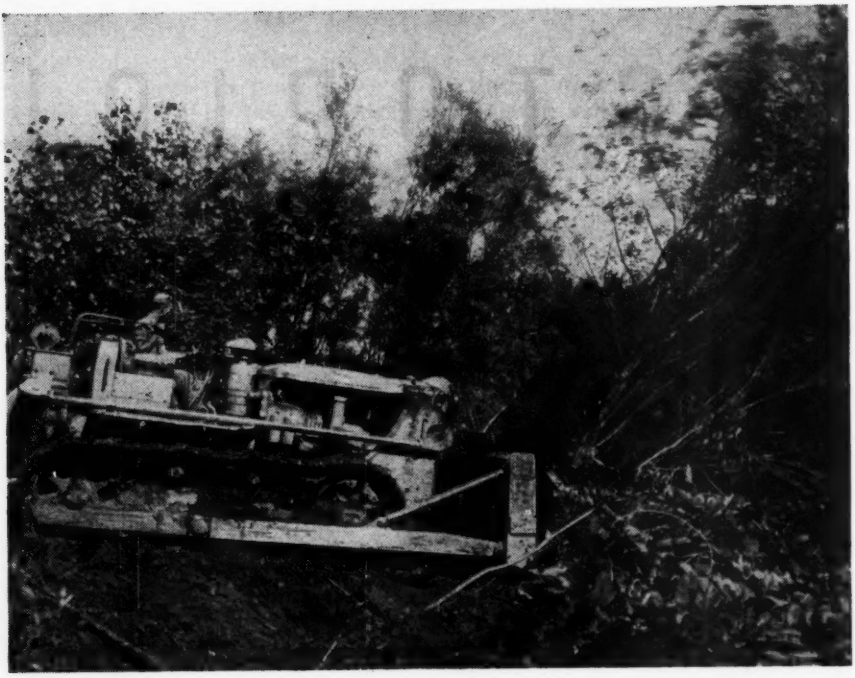
PICTORIAL

The Next Car Must Stop!

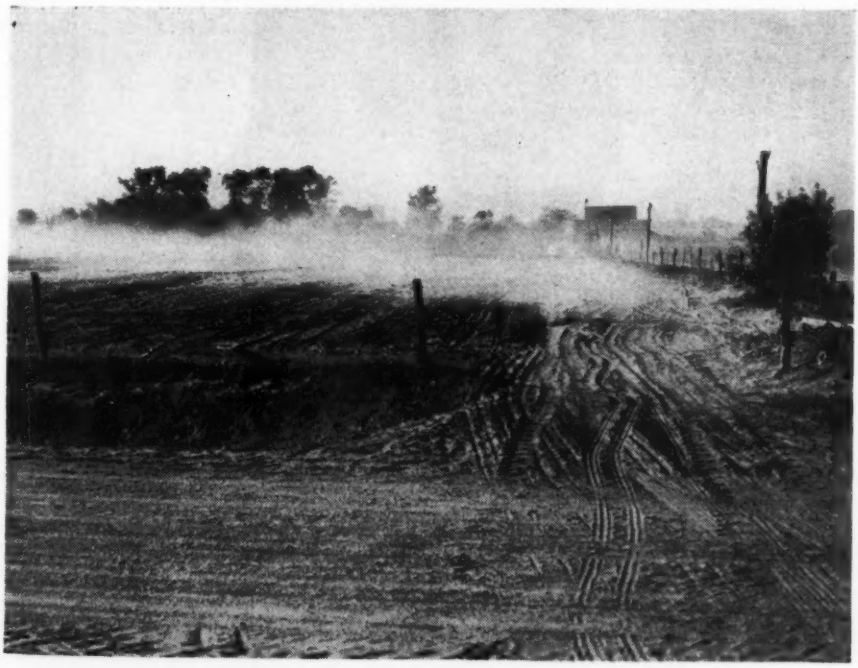


Above: A "push-over" for good crops.

Below: Turning brush into pasture.

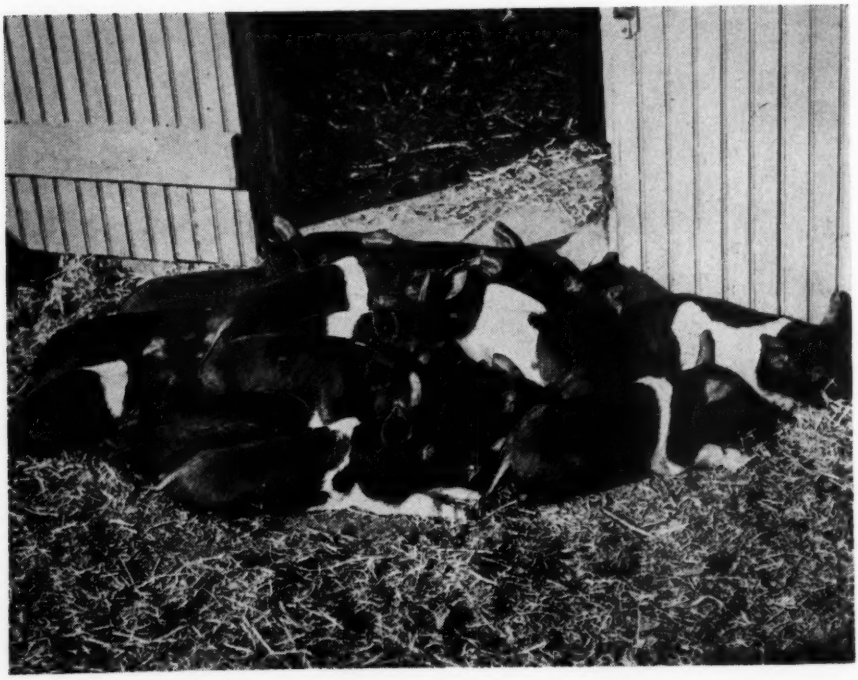
Above: Let-er-fly—plant-food gained.

Below: Dust in motion—fertility lost.



Above: Competent help.

Below: A pile of pigs.



The Editors Talk

Youthful Ambassadors of American Agriculture

Early in June, some 40 healthy and alert American farm boys and girls will leave to spend 4½ months living and working with farm families in Europe. These delegates have been nominated by directors of agricultural extension or the officials of an adult organization, are between the ages of 18 and 25 years, high-school graduates, and have a background of farm work and farm living, experience in rural organizations, and knowledge of educational activities. Their expenses are underwritten by individuals, groups, and organizations interested in rural youth, and no Federal or State government funds are expended for this purpose.

Each delegate will have devoted considerable time and energy to an intensive advance orientation course in geography, history, culture, and agriculture of both the United States and the country to be visited. He will live on assigned farms to which he has been invited in the country to which he is sent, sharing in the daily work and social life of the family, doing his part in a program intended to contribute toward a better understanding by his hosts and himself of the customs, life, and culture of the other's country. On returning to the United States, he is expected to remain out of school or college during the fall and devote considerable time to speaking and extending to others the benefits of his experience.

This is our part of an International Farm Youth Exchange Project which began in 1948 when 17 delegates went to Denmark, France, Great Britain, Italy, Netherlands, Norway, and Sweden. In 1949 there were 31 delegates representing 22 States. In return, farm families in this country have been hosts to 39 delegates from European countries.

The objectives of the project are aid in the development of an informed junior farm leadership and help to young people in understanding something of international relationships and the problems of world peace. In these times of unsettled world conditions paramount in everyone's mind, and particularly in the minds of youth facing the future, this exchange is most praiseworthy. Our delegates during the past two years have done much to spread the doctrines of American agricultural efficiency and this year's "ambassadors" will ably extend the good will already engendered.

Alfalfa

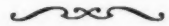
Alfalfa is one of the most universally grown crops in the United States. It is estimated that about three per cent of all the cultivated land is now devoted to alfalfa, a percentage which undoubtedly will increase as more acres are released from the production of the staple crops and more is learned about the requirements for success with this outstanding hay and pasture plant

Known for centuries, its origin is attributed to Persia. Coming westward with civilization, it still was to be found chiefly in semi-arid regions where the

soil was rich in mineral nutrients. On this continent it first became established in Mexico and southern California. But now, in the words of Joseph E. Wing, "It fits on every farm, once the soil is made right. It is a permanent thing. It is a mine of riches, a magazine of rich provender, a source of fertility wherewith to build animals and to build soils."

Yet thousands of dollars are wasted every year on alfalfa seed by farmers who know the value of the crop but do not know enough about its plant-food requirements and management. Recently published by the New Jersey Agricultural Experiment Station, Bulletin 748 "Alfalfa—Its Mineral Requirements and Chemical Composition" is one of the best treatises on the subject which has come to hand. The authors, Firman E. Bear and Arthur Wallace have been exhaustive in their research and inclusive in their presentation of practical information for success in obtaining good stands and maintaining high yields.

With the purpose of adding to the dissemination of their findings, and through the courtesy of the New Jersey Agricultural Experiment Station, we are beginning in this issue the reprinting of this bulletin. It will be continued in two forthcoming issues, after which we shall have reprints available.



Surplus Acres

"The long-expected adjustments from the wartime pattern of agricultural production are on in earnest in 1950. Problems of adjustment will, in one way or another, affect practically every farmer in the country in coming years." Thus, does Carl P. Heisig of the Bureau of Agricultural Economics, U. S. Department of Agriculture, express what everyone seriously looking into the future of American agriculture knows.

To many of these serious-minded, the almost "stock" adjustment solution—"Turn to Grass"—may have become a poser. What will we do with all the grass after we get it? True, it holds the soil in place and helps maintain its fertility. But for profit, it should be utilized by livestock and what are we going to do with all the livestock needed to utilize all of the grass?

After considering factors of higher consumption of food per person, rapidly expanding population, and demands for food for export, it is interesting to note that Mr. Heisig and his associates in the Division of Farm Management and Costs still feel that for the bulk of the 30 to 35 million surplus acres in prospect, the answer seems to be largely more hay and pasture to produce milk and beef.

Contemplating what effect such a shift would have on the prices of milk and beef, these economists say that if per capita consumption of meats, especially beef, could be increased by only 10 pounds from the 145 pounds consumed in 1949 back to the 155 pounds consumed in 1947, and if fluid milk consumption could be increased from the 380 pounds per capita of 1949 to the 432 pounds actually consumed in 1945, we would have a ready market for the forage from about 35 million acres. These estimates are on the basis of present population. If it is assumed that 5 or 6 years will be required for such a shift, population will have increased 8 to 10 million.

The major unknowns, they say, seem to be whether consumer incomes will remain high, how much of a decline in prices of milk and meat would be necessary to induce increased consumption, and what progress farmers can make in reducing costs so as to make increased production profitable even at lower prices to consumers. Ways and means of reducing costs by better farm planning, through farm reorganization, or through adoption of improved practices, techniques, and machinery will be particularly important.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay[1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1925.....	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926.....	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941.....	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942.....	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943.....	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945.....	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946.....	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947.....	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948.....	31.0	38.7	153.0	219.0	136.0	205.0	19.00	67.80	....
1949									
May.....	29.97	32.5	181.0	273.0	122.0	200.0	17.70	50.40	....
June.....	30.13	31.5	175.0	264.0	121.0	186.0	16.40	46.70	....
July.....	30.08	56.5	155.0	283.0	125.0	182.0	15.65	37.50	....
August.....	29.32	44.6	154.0	267.0	118.0	179.0	16.05	44.40	....
September...	29.70	48.7	138.0	230.0	116.0	187.0	16.25	43.50	....
October.....	28.70	47.4	130.0	196.0	109.0	189.0	16.75	41.80	....
November...	27.76	43.4	134.0	189.0	102.0	190.0	16.75	42.30	....
December....	26.50	45.4	131.0	202.0	113.0	193.0	17.15	43.30	....
1950									
January.....	26.47	39.7	136.0	215.0	115.0	192.0	17.15	43.60	....
February....	27.50	34.1	133.0	221.0	116.0	193.0	16.75	43.60	....
March.....	28.05	32.0	132.0	222.0	119.0	198.0	16.45	43.00	....
April.....	28.74	....	134.0	228.0	126.0	201.0	16.65	44.40	....

Index Numbers (Aug. 1909–July 1914 = 100)

1925.....	158	168	245	188	109	163	108	140	143
1926.....	101	179	189	134	116	138	112	98	139
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	89	81	109	74	87	110
1938.....	69	196	80	79	76	64	57	97	88
1939.....	73	154	100	84	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	96	111
1941.....	137	264	116	105	117	107	82	211	129
1942.....	153	369	168	134	143	124	91	202	163
1943.....	160	405	188	235	174	154	125	231	245
1944.....	167	420	214	216	170	160	139	234	212
1945.....	181	366	205	232	198	170	127	227	224
1946.....	263	382	178	248	212	209	141	319	204
1947.....	257	380	232	248	336	259	148	381	249
1948.....	250	387	220	249	212	232	160	301	238
1949									
May.....	242	325	260	312	190	226	149	224	213
June.....	243	315	251	301	188	210	138	207	175
July.....	243	565	222	323	195	206	132	166	185
August.....	236	446	221	305	184	202	135	197	174
September...	240	487	198	263	181	212	137	193	205
October.....	231	474	187	224	170	214	141	185	170
November...	224	434	192	216	159	215	141	188	213
December....	214	454	188	230	176	218	144	192	196
1950									
January.....	213	397	195	245	179	217	144	193	261
February....	222	341	191	252	181	218	141	193	203
March.....	226	320	190	253	185	224	139	191	168
April.....	232	...	192	260	196	227	140	221	205

Wholesale Prices of Ammoniates

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	12.94	10.59	10.84	9.85
1949	3.15	2.29	10.11	13.18	10.73	10.62
May	3.19	2.27	9.43	12.36	9.71	9.11
June	3.19	2.28	9.65	13.34	10.02	9.71
July	3.19	2.32	11.07	14.97	11.53	10.78
August	3.19	2.32	11.88	14.49	12.75	12.14
September	3.19	2.32	9.83	14.53	11.53	11.53
October	3.08	2.32	9.94	14.58	11.29	11.65
November	3.00	2.32	10.39	14.21	10.39	10.78
December	3.00	2.32	12.94	13.88	9.87	9.94
1950						
January	3.00	2.32	10.27	13.79	10.26	10.08
February	3.00	2.32	9.37	13.45	8.96	8.96
March	3.00	2.32	9.70	13.01	10.17	9.34
April	3.00	2.32	10.34	12.58	10.39	8.19
Index Numbers (1910-14 = 100)						
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949	117	80	289	373	318	302
May	119	80	269	350	288	259
June	119	80	276	378	297	276
July	119	81	316	424	342	306
August	119	81	339	410	378	345
September	119	81	281	412	342	328
October	115	81	284	413	335	331
November	112	81	297	403	308	306
December	112	81	311	393	293	283
1950						
January	112	81	293	391	304	286
February	112	81	268	381	266	255
March	112	81	277	369	302	265
April	112	81	295	356	308	233

Wholesale Prices of Phosphates and Potash * *

	Superphosphate, Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports[2]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports[2]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[2]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1925	.600	2.44	6.16	.584	.860	23.72	.483
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.432	.706	18.93	.195
1948	.764	4.27	6.60	.397	.681	14.14	.195
1949	.770	3.88	6.22	.397	.703	14.14	.195
May	.770	3.85	7.06	.375	.720	14.50	.200
June	.770	3.66	7.06	.330	.634	12.76	.176
July	.770	3.60	5.87	.353	.679	13.63	.188
August	.770	3.60	5.47	.353	.679	13.63	.188
September	.770	3.65	5.47	.353	.679	13.63	.188
October	.770	3.75	5.47	.375	.720	14.50	.200
November	.770	3.76	5.47	.375	.720	14.50	.200
December	.770	3.76	5.47	.375	.720	14.50	.200
1950							
January	.762	3.76	5.47	.375	.720	14.50	.200
February	.760	3.76	5.47	.375	.720	14.50	.200
March	.760	3.76	5.47	.375	.720	14.50	.200
April	.760	3.76	5.47	.375	.720	14.50	.200

Index Numbers (1910-14 = 100)

1925	110	68	126	82	90	98	74
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949	144	108	128	67	74	58	83
May	144	107	145	68	76	60	83
June	144	101	145	62	67	53	80
July	144	100	120	65	71	56	82
August	144	100	112	65	71	56	82
September	144	101	112	65	71	56	82
October	144	104	112	68	76	60	83
November	144	104	112	68	76	60	83
December	144	104	112	68	76	60	83
1950							
January	142	104	112	68	76	60	83
February	142	104	112	68	76	60	83
March	142	104	112	68	76	60	83
April	142	104	112	68	76	60	83

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1925.....	156	153	151	112	100	131	109	80
1926.....	146	150	146	119	94	135	112	86
1927.....	141	148	139	116	89	150	100	94
1928.....	149	152	141	121	87	177	108	97
1929.....	148	150	139	114	79	146	114	97
1930.....	125	140	126	105	72	131	101	99
1931.....	87	119	107	83	62	83	90	99
1932.....	65	102	95	71	46	48	85	99
1933.....	70	104	96	70	45	71	81	95
1934.....	90	118	109	72	47	90	91	72
1935.....	109	123	117	70	45	97	92	63
1936.....	114	123	118	73	47	107	89	69
1937.....	122	130	126	81	50	129	95	75
1938.....	97	122	115	78	52	101	92	77
1939.....	95	121	112	79	51	119	89	77
1940.....	100	122	115	80	52	114	96	77
1941.....	123	130	127	86	56	130	102	77
1942.....	158	149	144	93	57	161	112	77
1943.....	192	165	151	94	57	160	117	77
1944.....	196	174	152	96	57	174	120	76
1945.....	206	180	154	97	57	175	121	76
1946.....	234	197	177	107	62	240	125	75
1947.....	275	231	222	130	74	362	139	72
1948.....	285	250	241	134	89	314	143	70
1949								
May.....	253	244	227	134	99	293	144	72
June.....	249	242	223	134	99	304	144	65
July.....	246	240	225	140	100	349	144	68
August....	244	238	222	143	100	372	144	68
September.	247	238	225	138	100	334	144	68
October...	242	237	222	138	98	331	144	72
November.	237	236	221	136	96	321	144	72
December..	233	237	221	136	96	317	144	72
1950								
January...	235	238	221	135	96	316	142	72
February..	237	237	223	132	96	286	142	72
March....	237	239	223	134	96	305	142	72
April.....	241	240	222	135	96	313	142	72

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] All potash salts now quoted F.O.B. mines only: manure salts since June 1941, other carriers since June 1947.

**** The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Twelfth Annual Report Of The Arizona Fertilizer Control Office—Fertilizers and Agricultural Minerals, Year Ending December 31, 1949," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Spec. Bul., Feb. 1950.

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"Rates of Fertilizer On Tung Trees," Agr. Exp. Sta., Miss. State College, State College, Miss., Cir. 150, Dec. 1949, F. L. Welch.

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"Potassium in Oklahoma Soils: And Crop Response to Potash Fertilizer," Agr. Exp. Sta., Okla. A & M College, Stillwater, Okla., Bul. No. B-346, Mar. 1950, H. J. Harper.

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"Soil Survey, Cheshire and Sullivan Counties, New Hampshire," Agr., Exp. Sta., Univ. of N. H., USDA, Wash., D. C., No. 23, Dec. 1949.

"Soil Survey, Rock County, Minnesota," USDA, Wash., D. C., No. 21, Nov. 1949.

"Columbia Basin Project Opportunities, Responsibilities & Needs in Irrigation Development," US Dept. of Interior, Bur. of Reclamation, Ephrata, Wash., Rpt. No. 2, Feb. 1949.

"Soil Survey of Colchester County, Nova Scotia," Exp. Farms Serv., Dominion Dept. of Agr. Truro, N. S., Rpt. No. 3, 1948, R. E. Wickland and G. R. Smith.

Crops

"Fall Tomatoes In North Alabama," Cir. 202; "Snap Beans," Cir. 204, Ext. Serv., Ala. Poly. Inst., Auburn, Ala., May 1949, Lyle Brown.

"Nitrogen Fertilization of Wheat Following Grain Sorghum," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Mimeo. Rpt. 93, Oct. 1949, L. Brimhall.

"Production Items and Costs for Enterprises on Rice Farms," Agr. Exp. Sta., Univ. of Ark., Fayetteville, Ark., Bul. 489, Oct. 1949, M. W. Slusher and Troy Mullins.

"Tobacco Seedbeds," Conn. Agr. Exp. Sta., New Haven, Conn., Cir. 175, Feb. 1950, P. J. Anderson and T. R. Swanback.

"Landscape Plants for Florida Homes," Dept. of Agr., Tallahassee, Fla., New Series No. 106, Sept. 1949, J. V. Watkins.

"Hibiscus in Florida," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Bul. 467, Feb. 1950, R. D. Dickey.

"Adaptability of Vegetable Varieties to the Everglades and Adjacent Areas," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., Cir. S-7, Nov. 1949, J. C. Hoffman.

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"Indiana Summary 1947, 1948, and 1949 Wheat Demonstrations," Div. of Agron., Purdue Ext. Serv., West Lafayette, Ind., AY 1-B.

"Indiana Summary 1947, 1948, and 1949 Wheat Demonstrations," Div. of Agron., Purdue Ext. Serv., West Lafayette, Ind., AY 3-B.

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Physical Soil Factors . . .

(*From page* 10)

Alkali. In arid regions many of the soils contain soluble salts which may be grouped under the general term "alkali." When these salts accumulate on the surface or within the root zone, they may be detrimental to plant growth. This condition is usually closely associated with either present

or past conditions of poor drainage. Here again, as in most factors which limit plant growth, it is associated with some adverse condition in the depth, permeability, and texture of the soil. The installation of drains may greatly improve alkali soils.

Slick spots are areas of very slowly permeable soils in which a defloculation of the soil particles has been brought about largely by excess sodium. These spots may be improved by any method which will cause water to penetrate more freely, such as the application of organic matter, soil amendments, irrigation, or fertilizer.

Low nutrient level. A few soils are inherently low in plant nutrients, probably because the parent material from which they are derived is deficient in these nutrients. Acid or leached soils, as well as a large percentage of the claypan and hardpan soils, may also be inherently low in nutrients. All of these soils respond to fertilization. Of course, any inherently fertile soil will lose its productiveness if cropped for a long period of time and eventually will need fertilization.

Micro-relief. The term micro-relief is used to describe a surface irregularity not necessarily associated with major topographic features such as slope. Small drifting sand dunes in areas subject to wind action, hog-wallows, or small mounds are characteristic of many of the hardpan and some claypan soils; and stream-channeled areas lying adjacent to major streams which have overflowed and left the surface irregular are examples of micro-relief which affect plant growth. These conditions can, to a considerable extent, be remedied by leveling and farm-management practices.

Acidity. In areas of high rainfall, soils tend to become acid in reaction. Many plants prefer a neutral or slightly basic soil for highest production. An acid condition may be remedied by the application of lime.

None of these conditions, including poor drainage and excessive slopes, normally occur on soils having deep, permeable profiles of medium texture. Most unsatisfactory conditions leading to poor plant growth are in some way associated with an inferior condition in one or more of the basic qualities—depth, permeability, and texture.

Lack of sufficient moisture during the growing season may be a controlling factor in arid and semi-arid areas, or low temperatures may limit production to certain crops or seasons, but these are both essentially climatic rather than soil factors.

There are many soils on which production may be increased by fertilization, drainage, liming, leveling, irrigation, and other management practices. Some soils may even be raised from an unproductive capacity to a productive capacity by man-applied means, but it should be fully recognized that regardless of the improvement in an otherwise handicapped soil, the same amount of effort or expenditure in fertilization, irrigation, leveling, etc., on a deep, permeable, medium-textured soil will pay even greater dividends in increased yields. Nothing that man can do to a soil can entirely compensate for shallow depth, slow permeability, and undesirable texture.

Nothing that has been said about the advantage of a deep, permeable, medium-textured soil should be construed to mean that such soils do not need periodic fertilization and the best of management to keep them productive. Any soil will lose its productiveness if cropped for a long time with no replenishment of plant nutrients. In fact, much greater response to fertilization and proper management can be expected from good soils than from poor soils (Fig. 6). It is more profitable to maintain the productiveness of a soil which will produce 50 bushels or more per acre than to double the yield on a soil which will produce only 10 bushels.

Good progressive farmers are rarely

found on poor soils, and conversely, poor and careless farmers seldom have good soils. The exceptions to this are when a good farmer discovers some land which has the potentialities of a productive tract but which is at present unproductive because of poor drainage, alkali, or high water table, and he believes that through his efforts the inhibiting factors may be overcome. Some farmers, of course, produce only specialty crops and will be found where these crops can best be produced and where the over-all productive capacity of the soil may be a secondary consideration.

Fertilizers Help Make Humus

(*From page* 26)

Fertilizer use is essential for promoting fundamental processes carried on in the soil by many organisms. The processes associated with humification which results in the liberation of nutrients from the organic and mineral portions of the soil to support plant growth are carried on by a multitude of participating organisms that obtain what is essential for their own nutrition from the materials which they decompose and from the soil. What the bacteria, fungi, and other organisms are able to obtain and what is left over for the crop depend in part upon the composition of the material introduced into the soil for their decomposition.

When straw of relatively low nutrient content is returned to the soil, there likely will be at least a temporary shortage of nutrients needed to support the organisms that decompose the straw, particularly a shortage of nitrogen. Straw may contain as low as half of one per cent of nitrogen or less. About two per cent is more favorable to decomposition. The number of organisms is limited by their food supply. They must have nitrogen for formation of the proteins for the protoplasm of their cells. The number of organisms cannot increase beyond the supply of nitrogen to meet their needs. Straw which is relatively rich in cellulose and other carbohydrates has an excess of energy material over protein material.

This condition is easily corrected by using a nitrogen fertilizer to provide the organisms with this necessary nutrient element. Then straw will be decomposed more rapidly and at the same time more humus will be produced from it for improving the soil. Experimental work has shown that when straw is added to the soil and supplemented with commercial fertilizer to bring the composition of the straw up to that of farm manure, the results in increased crop yields are as good where straw is used as where the manure is used.

Humus for soil improvement can be made out of nearly any kind of organic matter if properly supplemented with commercial fertilizers. Sawdust, which is principally cellulose and lignin with little nitrogen or other nutrient elements needed by plants, will make humus and improve the soil if properly supplemented with fertilizer including nitrogen, phosphorus, potassium and, in Oregon, frequently sulfur. Any reasonable amount of sawdust can be applied to the soil at one time with no harmful effects to a crop if the necessary fertilizer is also used. Soon the sawdust-treated soil will take on a superior tilth and the growth of plants will be greater than where no sawdust was used. Usually, however, better organic materials than sawdust can be made available for renewing the humus.

Organic materials and fertilizers therefore effectively supplement each other for soil improvement. Some types of organic materials

can be advantageously combined—the low nitrogen with the high nitrogen, the green, immature, and succulent with the ripened and woody growth, to obtain more effective use of the materials for making humus. A young growth of weeds in a mature grain stubble provides such a combination, as does also the dead leaves in the orchard with the green cover crop.

There are considerable tonnages of straw, corn stalks, leaves, and other litter frequently destroyed by fire that could much better be returned to the soil and supplemented with fertilizers to help bring about their decomposition. When there is sufficient recognition of the importance of both organic materials and commercial fertilizers for improving and conserving the soil while at the same time producing profitable harvests, fewer matches will be allowed in the field and more fertilizer bags will be brought to the farm.

. . . Perennial Forage in North Georgia

(*From page* 23)

possibilities, with good management, during the time that annual seeded areas are idle.

In an exploratory test to evaluate grazing, four cows have been placed on four acres of ladino and tall fescue that have been cross-fenced into paddocks of one and one-third acres each. By rotating areas, the four cows grazed 61 days on the paddock that was allowed to accumulate during fall. The cows have been allowed no grain and have had no hay except a portion of that harvested from the four acres during the previous summer.

Fig. 3. Hogs on fescue and ladino clover, November 1949.

The production of ladino clover and tall fescue apparently can increase forage production more in north Georgia than good practices have increased corn production. With equal expense, acre for acre of corn versus forage, the advantages of soil holding and building and higher economic returns per acre from grassland agriculture make it very inviting. Once established, annual maintenance of 4-12-12 at 500 pounds per acre and 100 pounds of ammonium nitrate, all applied in the fall, costing about $16 per acre, with livestock doing their own harvesting, makes this type of land use much more economical than high corn production on the same area. This is particularly true unless good producing animals are available to convert the corn to cash or the producer is interested in reducing his corn acreage to make room for more acres of highly productive, easily maintained areas of perennial clover and grass that bring a higher economic return. By proper fertilization and using adapted plants and varieties, practically any desired percentage of the total acreage in this area can be made to produce year round grazing.

Potassium Cures Cherry Curl Leaf

(*From page* 20)

leaf. Ratings were consolidated into curl leaf indices, and these are given in Table I.

TABLE I. CURL LEAF INDICES OF SOUR CHERRY TREES TWO YEARS AFTER TREATMENT

Trees set, 1942. Treated, 1947. Observations, 1949. Indices calculated from means of three persons' ratings of three replications with 27 trees under each treatment.

Treatment No.	1947 Treatment—lbs. per acre over all	1949 Curl leaf index
8	1,000 lbs. 0–9–0	100
1	None	97
10	None in 1947—1,000 lbs. 0–9–27 in 1948	79
7	1,000 lbs. 0–9–27 and 200 minor element mixture	76
2	1,000 lbs. 0–9–27	59
6	1,000 lbs. 0–9–27 and 200 manganese sulfate	57
3	1,000 lbs. 0–9–27 with potassium as sulfate	57
9	1,000 lbs. 0–0–27	51
5	8″ straw mulch around trees	41
4	8″ straw mulch and 1,000 lbs. 0–9–27	33

MSD = 17. O = No curl leaf. 100 = Severe curl leaf.
Annual nitrogen treatments were made on the entire orchard.
1947 soil tests: pH—6.0-7.5; Av. P—20-30 lbs.; Av. K—80-90 lbs.

Time and soil moisture were and remain important factors in tree recovery. Trees can suffer nutrient deficiency for several years and still live. But also, correction of the deficiency may not result in immediate recovery, especially with insufficient moisture. Mulch had a multiple effect, including addition of potassium. Because of drouth, mulched trees got a lead on fertilized trees and are holding this lead. Where 0-9-27 was applied a year earlier in treatment No. 9 than on treatment 10, a lead was likewise established.

Superphosphate alone caused no improvement, but potash alone effected about a 50 per cent recovery. Potassium as sulfate or as muriate showed no significant differences between them (treatment 2 and 3). Since the index for the minor element mixture with 0-9-27 was above that for 0-9-27 alone, it shows that minor element deficiency was not responsible for curl leaf.

Cherry growers in Door County will be using potash or 0-9-27 fertilizer along with their regular nitrogen applications. They realize that by the time trees indicate potassium deficiency through curl leaf, they already will have done much less than their best for several years, and that prevention pays even better than cure. Many orchards, especially the younger ones with severe curl leaf, will be mulched as well as fertilized in order to assure earlier recovery even in drouthy seasons.

Whether mulches which supply little or no potassium would be of real value was not determined. Insofar as they would encourage root feeding in more of the limited surface soil volume, such mulches should give trees a temporary respite but at the expense of the small amount of remaining available soil potassium. Stoppage of cultivation doubtless had a similar though lesser contributing beneficial effect. Since evidence points so conclusively to inadequate potassium uptake as the cause of cherry curl leaf, any practice which fails to restore the diminished soil supply of available potash should be regarded as a stopgap, even though the practices themselves are sound and beneficial.

For small cherry trees with curl leaf in sodded or cultivated orchards, one may apply 3 to 6 lbs. of 0-9-27 or similar fertilizer per tree under and somewhat

beyond the tips of branches and also a mulch. This should carry trees into production; but if no mulch can be provided, it may be desirable to repeat the fertilizer application in about two years.

For larger producing trees with curl leaf, mulches would also be excellent but are not usually practical. From 5 to 20 lbs. of 0-9-27 per tree can be applied under and somewhat beyond the branches. Tree size, severity of curl leaf, and density of cover crop growth will govern how much to use per tree.

Doubtless many orchards are on the verge of curl leaf development and to ward it off and keep trees thrifty, a maintenance treatment of 3 to 8 lbs. of 0-9-27 (or similar fertilizer) per tree every year or two may be made. Exactly what rate per tree is best will probably be hard to establish. Therefore, after 5 to 10 years of using this or any other regular maintenance treatment, a phosphorus and potassium inventory should be made by soil testing. Available phosphorus probably need not exceed 60-80 lbs. per acre eight inches deep and available potassium 250 to 300 lbs. When past treatments have built up either the available phosphorus or potassium to these levels, (1) the formula should be modified, (2) clear phosphates or clear potash may be applied, or (3) rate of treatment may be reduced.

In sodded orchards phosphate and potash fertilizers may be broadcast on open soil at any convenient time. The rate per tree should be somewhat high because the trees must feed at the "second table" after the needs of the cover crop has been appeased. In cultivated orchards fertilizers should be applied shortly before they can be cultivated in. If fertilizer is left on a bare soil surface, heavy rains may wash it away.

Nitrogen treatments, as required by size and age of trees, should be made in spring. If both nitrogen and phosphate and potash are to be spring-applied, a complete high-nitrogen, high-potash fertilizer may be used.

Reseeding Crimson Clover . . .

(*From page* 12)

in North Alabama, Tennessee, Kentucky, and Oregon. Fairly heavy type, well-drained soils were generally regarded as necessary. However, with proper plant foods, the reseeding type crimson clover will grow on well-drained soils wherever the climate is favorable.

Land preparation is important, especially for establishing the first stands. Summer fallowed land is preferred and may be conveniently arranged after harvesting small grain. Stands can also be established on lespedeza sericea and Johnson and Bermuda grasses by scarifying the sods slightly before sowing the crimson clover. Inoculation of the seed with the proper culture is very important on new land.

Reseeding crimson clover responds well to moderate liming and may be classed in the group requiring a medium lime content. Liberal amounts of phosphate and potash should be applied for this crop where the soil is known to be low in these plant foods. Experience in Alabama, Georgia, and Tennessee has shown beneficial results from the use of 15 pounds of borax per acre both in an improved inoculation of the clover and in seed yields. Recommendations for fertilizer in addition to lime are as follows: The use of 400-500 pounds per acre of 0-14-10, 0-12-12, or 0-14-7, with borax. On light sandy soils or soils of low fertility, it would be desirable to add two to three per cent nitrogen in the above

fertilizers to assist in getting the first crop established.

From 15 to 20 pounds of certified or known high quality seed per acre should be sown, preferably with a grass seed attachment on a cultipacker or grain drill. The date of planting should be about one month to six weeks ahead of the average date of first frost. For much of the South this is during last of September through October. A good rule is to plant after a good rain on a firm seedbed and cover lightly with a cultipacker, weeder, or drag.

Crimson clover seed germinates quickly and with adequate moisture and plant foods will make rapid growth. On soils of low fertility and low organic matter content, it makes a very poor growth until spring when warm weather enables the nodules to supply the needed nitrogen for rapid growth.

With proper management reseeding crimson clover will prove a highly prized crop in the South. As an example, Autauga county, Alabama, has increased its acreage from a few acres on a few farms to 8,000 acres on more than 100 farms within the last three years. This acreage will be increased four-fold next year. The large increase in acreage was due to the value of this crop in additional farm income through winter grazing, seed sales, and soil building. Other adapted areas of the South should grow reseeding crimson clover to improve their farming enterprise.

Alfalfa—Its Mineral Requirements . . .

(*From page* 18)

a year preceding the test, typical K-deficiency symptoms were apparent early in the spring of 1947 (Fig. 6). Many of the plants never recovered from this early deficiency. Total yields undoubtedly would have been considerably higher if no lack of K had ever been allowed to develop.

The highest yield was obtained for the heaviest rate of K application (Table VI). Plants on plots receiving 180 pounds K_2O an acre were the only ones that did not show deficiency symptoms in the third cutting. A 60-pound application produced maximum yields for only one cutting following its

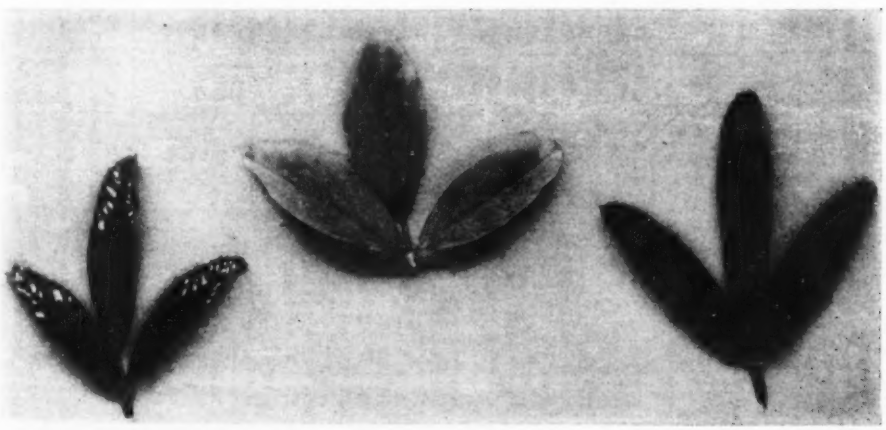

Fig. 6. White spots early in the year and yellow discoloration later indicate potassium deficiency. Normal leaf at right.

TABLE IV.—FOUR-YEAR YIELDS RANGER ALFALFA AS INFLUENCED BY KIND, AMOUNT, AND DATE OF APPLICATION OF FERTILIZER TOPDRESSINGS. IN POUNDS DRY MATTER PER ACRE—MEAN OF THREE REPLICATIONS.

Plot	Treatment*	1946				1947				1948				1949				4-Yr. Total
		June 6	July 18	Sept. 5	Total	June 11	July 23	Aug. 25	Total	June 10	July 16	Aug. 30	Total	June 6	Aug. 5	Sept. 10	Total	
1	K+B	5100	2950	2230	10,280	2930	2730	1460	7120	2740	2290	1750	6780	2650	1380	790	4820	29,070
2	P+B	5160	2990	2210	10,360	3090	2780	1290	7160	2180	1730	1020	4930	930	770	690	2390	24,830
3	K+P+B	5150	3040	2210	10,400	3730	2890	1540	8160	3420	2530	1580	7530	3170	1880	900	5950	32,040
4	K+P+B	5120	3040	2200	10,360	3200	2990	1560	7750	2850	2500	1730	7080	2370	1670	930	4970	29,150
5	K+P+B	5190	3220	2170	10,580	3980	2890	1770	8640	3070	2400	1850	7320	2790	2180	920	5890	32,430
6	K+P+B	5250	3100	2190	10,540	2960	3030	1670	7660	2910	2600	1680	7190	2340	1340	880	4560	29,940
7	2K+P+B	5130	3090	2160	10,380	3080	3110	1660	7850	3210	2640	2040	7890	3130	2060	1100	6290	32,410
8	3K+P+B	5170	3110	2080	10,360	2890	2960	1570	7420	3620	2810	2140	8570	3550	2690	1220	7460	33,800
9	K+P+B+Na	5390	3140	1960	10,490	2720	2950	1630	7300	2830	2450	1810	7090	2550	1430	960	4940	28,820
10	K+P+B+N	5180	3190	2130	10,500	2540	3020	1650	7210	3560	2370	1650	7580	2630	1360	850	4840	30,130
11	K+P+B+N	5120	3010	2090	10,220	2650	3260	1540	7450	2820	2730	1760	7310	2350	1330	1120	4800	29,770
12	K+P+B+N	5190	3030	2030	10,250	2710	2530	1570	6810	3220	2190	2350	7760	2290	1410	1280	4980	29,800
13	2K+P+B+N	5290	3140	1980	10,410	2750	3290	1730	7770	3110	2900	1890	7900	3120	1820	1310	6250	32,320
14	K+P+B+N+Na	5320	2980	1930	10,230	2850	3290	1600	7740	2660	2590	1780	7030	2770	1760	1320	5850	30,850
15	2K+2P+B	4900	2990	1950	9,840	2640	2850	1590	7080	2990	2490	1940	7420	3010	2160	1300	6470	30,800
16	2K+2P+B+Mg	4920	3090	1980	9,990	2590	2940	1610	7140	3130	2810	1820	7760	3030	1900	1230	6160	31,040
17	2K+2P+B+2Mg	5040	3250	1990	10,280	2570	3150	1580	7300	3360	2610	2000	7970	3280	1980	1200	6460	32,000
18	K+P+B+2Mg	5150	3270	2010	10,430	2630	3200	1660	7490	2940	2420	1600	6960	2260	1450	990	4700	29,580
19	2K+2P+B+Ca	5410	3010	2100	10,520	2810	2980	1650	7440	3560	2740	2050	8350	3120	2290	1260	6670	32,980
20	2K+2P+B+Mo	5110	3160	2090	10,360	2830	3050	1660	7540	3230	2520	2040	7790	3120	2220	1330	6670	32,350
21	2K+2P	4980	3210	2070	10,260	2660	2840	1690	7190	3070	2630	1850	7550	2910	2250	1090	6250	31,240
22	K+P	4980	3170	2060	10,210	2730	2850	1590	7170	2930	2450	1470	6850	2540	1310	910	4760	29,080
23	———	5150	3000	2180	10,330	2700	2670	1330	6700	2070	1470	920	4460	900	470	410	1780	23,270
24	5K+5P	5330	3300	2440	11,070	4250	3080	1550	8860	3190	2230	1390	6810	1630	1160	790	3520	30,260
25	2K+2P+B	6250	2740	2050	11,040	3620	3040	1640	8300	3450	2470	1850	7770	3090	1990	1340	6420	33,450
	Mean				10,390				7530				7260				5366	30,456

* Per acre—K = 60 lb. K_2O, P = 60 lb. P_2O_5, N = 60 lb. N, B = 20 lb. borax, Na = NaCl equivalent to K, Ca = 1,000 lbs. $CaCO_3$, Mg = 160 lb. MgO as $MgSO_4 \cdot 7H_2O$, Mo = 5 lb. sodium molybdate. All treatments applied after first cutting except plots 3 and 10—early spring plots; 5 and 12—after second cutting; plot 24—seeding time only; plot 6—P and B in early spring.

† During 1946, the alfalfa was entirely dependent on the fertilizer used in advance of seeding. Plot 5 received its topdressing September 9, 1946, but all other topdressings were first applied in 1947.

‡ Mixed seeding of alfalfa and timothy.

1949 was an abnormally dry year, the June rainfall being only 0.02 inch and that for June, July, and August being 6.73 inches below the average.

TABLE V.—EFFECT OF P, K, AND P + K TOPDRESSINGS ON ACRE YIELD OF ALFALFA AND ON ALFALFA AND WEED POPULATIONS AFTER 3 YEARS.

	Plot 23 No Fertilizer	Plot 2 P Fertilizer	Plot 1 K Fertilizer	Plot 4 P+K Fertilizer
1947 Acre yield.....*lb.*	6,700	7,160	7,120	7,750
1948 Acre yield.....*lb.*	4,460	4,930	6,780	7,080
1949 Acre yield.....*lb.*	1,780	2,390	4,820	4,970
Total Acre yield.....*lb.*	12,940	14,480	18,720	19,800
Alfalfa plants per A.*...*thousands*	87	122	174	201
Weeds.....*per cent**	87	75	39	35

* At time of first cutting in 1949.

use. Severe K-deficiency symptoms were always apparent in the third cutting following the annual use of that amount of K_2O, whether it was applied in early spring or after the first or second crop had been harvested. A 120-pound annual rate of application of K_2O was not excessive for such yields of alfalfa hay as this soil is capable of producing.

Annual P_2O_5 applications were much less effective than those of K_2O. This suggests the desirability, in topdressing, of using fertilizer grades that contain considerably higher percentages of K_2O than of P_2O_5. These experimental results indicate a need for a topdressing of about 500 pounds of an 0-12-24 grade of fertilizer.

(*To be Continued*)

TABLE VI.—EFFECT OF INCREASING INCREMENTS OF K AND TIME OF APPLICATION OF P + K AS TOPDRESSINGS ON YIELD OF ALFALFA OVER A 3-YEAR PERIOD.

Plot	Treatment*	Time*	Acre Yield			
			1947	1948	1949	Total
			lb.	*lb.*	*lb.*	*lb.*
Increasing increments of K as topdressings						
4	P+K	AFC	7,750	7,080	4,370	19,800
7	P+2K	AFC	7,850	7,890	6,290	22,030
8	P+3K	AFC	7,420	8,570	7,460	23,450
Time of application of P+K topdressings						
3	P+K	ES	8,160	7,530	5,950	21,640
4	P+K	AFC	7,750	7,080	4,970	19,800
5	P+K	ASC	8,640†	7,320	5,890	21,850
6‡	P+K	ES–AFC	7,660	7,190	4,560	19,410

* All plots received standard applications of borax. P = 60 lb. P_2O_5; K = 60 lb. K_2O; ES = early spring; AFC = after first cutting; ASC = after second cutting.

† Received first topdressing September 9, 1946. None of the other plots were topdressed until 1947.

‡ P in early spring, K after first cutting.

Gumbo and Gumption

(*From page* 5)

he saw a long ways ahead through the prairie dust, to the days when radicals of progress would shift all his native scenery and customs for him—when the homesteaders would be raising rust- and drought-resistant grain and thronging the local towns for movies and gadgets; and the Black Hills country would be full of gas stations, hotels, and garages to accommodate eastern motorists, whose high-powered cars would no longer ford the winding Teton, or be halted and detoured by the gorges, pinnacles, and desolate colored realm of the north wall of the Badlands. Maybe he thought that there was a real permanence to such items as Bill Hickok, Calamity Jane, Corbin Morse and his fabulous ranch, Bat Masterson, and their nomad neighbors, Sitting Bull and Red Cloud—*Pashuta Luta*. But he didn't reckon with the great stone faces on Rushmore mountain or the road-building kind of highwaymen.

Well, in due time our lurching conveyance brought us up lumbering through the sage to the eastern end of the track from Rapid City, at the tiny but ambitious town of Wasta. I learned later on while clerking for an Indian trader at Pine Ridge agency that Wasta in the Sioux language means Good. But taken casually from that angle, it did not seem to fit. However, we soon unloaded and reloaded our heavy personal luggage and took the train for the last few miles to Owanka —the "place to camp" along the meandering Box Elder Creek.

I HAVEN'T been out there to Owanka since the summer of 1911. An old chum of my prairie years has told me that the big main highway runs far northward of the site where the traders and the postal boys built the rude wooden stores with false fronts and pony racks, and where the red sectionhouse and box depot stood away back when.

About a half mile north of the broad valley where Owanka was nestled there was a steep and difficult hill in those days of the first claim squatters. Dad met us at the depot with a wagon and a team he had borrowed from another homesteader, and we piled in with stiff joints and started off with our baggage and the dog—heaving up that gravelly, hill road to the prairie upland. Here a narrow, aimless trail between a few wire fences led away for three miles to the quarter-section near the Beam schoolhouse—a dull, squatty, district school that had served the sparse population of youngsters since the original ranchers took over the Indian country in the seventies.

IT might be well to pause right now and declare fervently that ranch families like the Ike Beams and their friends never once molested or belittled us, contrary to the premonitions of the sallow driver on the stage. They even invited us to their round-ups and their anniversary parties, and advised us on building cave cellars and digging wells. For the record it should be known, that most of the mistrust and ill-will could be traced to the attitudes of the newcomers rather than to the grudge of the men who believed in beef and the open range.

Isn't it queer — all the little things we remember and the big ones we forget? For the life of me, I cannot tell the names of our township officers, the detailed nature of the ranch operations around us, the type of the soil we had, or the cost of barb-wire and groceries in the far-off claim era at the turn of the century.

But I recall many odd instances and random memories, mental cloud shadows, and passing incidents, here

and there without rhyme or reason, but all serving as accents to a kind of life that none of us shall ever live again. (Not while the productive surge of farming runs so high without requiring new developments.)

THAT first arrival at the yellow frame shack stands out. It was hardly a haven for the weary, especially a weary woman. Mother surely was "played out" and in no mood to look on life with candid hope and vivid reality, even had the lonely spot been bedecked with prairie flowers for her advent—which it was not. She had to climb down and drag her tired feet through the little doorway, where a mail-order stove was waiting for somebody's home economics; where a sleazey cotton curtain on wire loops separated the maternal and paternal couch from the single bed whereon my patchwork quilt was spread. Then between the sleeping side and the living and cooking and eating section was suspended a second curtain strung up at right angles to the other wire. The whole space was floored with unmatched lumber and the ceiling was just lean-to rafters.

Over-all dimensions of the claim abode were sixteen feet east and west by fourteen feet north and south. The "high side" of the shack faced south. It had a little step-like platform at the door and a wood and kindling storehouse to the west. On the east end was the necessary outhouse with a two-holer accommodation, and adjacent to the shack on the sunrise end was the customary food storage cave, banked over with a mound of gravelly clay gumbo. Tar paper covered the slanting roof, and the walls were sort of "insulated" with one air space between siding and sheathing boards.

We found out that life could change, all right. Every-day things and ordinary privileges of the eastern country were luxuries in the claim business. Whoever built our well had not done well. The casings were not soundly inserted, the platform was weak and wobbly, and hence certain wild creatures of various kinds had tumbled into the well and drowned. The taste of the fluid warned us and we boiled it regularly. Finally we had another well dug, properly lined, and safeguarded.

Our first night at the claim found us too tired to mind external disturbances. But on the second night we retired as usual before ten o'clock and shortly bedlam broke loose on the windswept prairies. At first the tumult sounded like the chorus made by young folks on a sleigh ride, but Dad assured us it was not a band of savages seeking revenge for our land stealing, but merely a couple of stray coyotes out on the prowl. I dug my head under the quilts and thought of the school-room chromo showing a lone wolf on the brow of a moonlit hill overlooking a lonely town. Then I felt a flutter in my hair. Thinking maybe my hair was standing up in fright, I clutched at a moving lock and grabbed a field mouse in my fist. Him I threw across the dark room, and made a mental vow to buy a few spring traps when I next traded at Owanka.

YES, this too was living in the rude and the raw. Not all the tall tales could be found in the state historical collections. Daniel Boone, Kit Carson and his kindred, Father DeSmet, and Buffalo Bill were being reincarnated by an unprepared and unwilling novice from the Class of 1907. Yet at sundry subsequent moments I have rejoiced indeed that in my short experience with pioneering a link was forged for me to give me fresh admiration for adventurous ancestors. And moreover, the sameness, the monotony, and the absence of many vital incentives train a fellow to be patient and serene. To be satisfied with a reasonable limit in things and to know that the best comes to him who waits and trusts help one to form a good philosophy.

Of course, it wasn't all just abiding with the "old folks" at home in the

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shack. The community had its quota of bright young bloods and jolly companions. I'd like to see a few of them again, such as Rolla Wilson, the Cottier boys, (and by all means, their sister), Chuck Brady, and Forest Peck. Sure, they're older now, maybe a bit forgetful of what we did at parties in the claim homes, at the battered schoolhouse, and at picnics on the Box Elder bottoms. What big stories we imagined, what hopes we nursed, and how pulsatingly young we felt—out there beyond the Missouri valley in the shadow of *Paha Sapa,* or the Black Hills to you.

WE went up to Deadwood sometimes on rare occasions. Spearfish Canyon and Buffalo Gap were household words. Harney's peak loomed above us westward while we broke the sod and made our arms numb in the chucking down of hand planters filled with seed corn, placed for the first time since creation under the surface of the prairie. Oats grew fairly well except in the whitish alkali spots, but never did agricultural seed thrive like the buffalo grass and the sage—for commercial fertilizers were not customary equipment for the Iowans and Nebraskans who made up the bulk of the Pennington county settlers. The remnants of the scattered cattle and buffalo chips were dry and useless for plant food, and nobody had enough livestock to make a respectable manure pile.

Finally, after long sojourn in that remote habitation within distant view of the shimmering Badlands, Dad got his belly full of pioneering. We had a husky neighbor on the north, proving up on the next quarter, who had enough of a working crew in his family to undertake more risks and duties. So a sale was consummated to Brother Fuller at a fair price per acre, and it left Dad a small margin after cash preemption was over. Then with a series of hearty good-byes and come-back-won't-you farewells, we three closed the

door, boarded the eastbound rattler, and vanished from Dakota forever as residents. One return journey was made five years afterward, just so I might renew acquaintances and see what changes time had wrought.

Let nobody speak up and declare that Dad and others of his ilk were gamblers and exploiters, instead of founders of farm prosperity. If we study the methods of the suit-case farmers and land lessors today who plunge and plunder fertility from topsoil subject to erosion and wind destruction, and who chase the high dollar regardless of conservation principles—then any primitive effort at settlement and colonization such as our associates indulged in forty years ago is pure and undefiled. It we say that the men who went out there and lived in humble shacks and sold for a few dollars an acre gain were exploiters, then those who settled there before them and pastured the public domain and made snug fortunes on a free and open range might also be blamed equally for greed.

BUT now we know otherwise. I am sure we can go to any county agent in Dakota and visit any laboratory experts in college work on the plains and find that agriculture today is producing more abundantly and its devotees are wealthier, man for man, than any layers of civilization who preceded them into the sunset land.

Certainly, therefore, I have no remorse or regrets or drawbacks to blur my retrospective memories of days gone in Dakota. My only real regret is that I am not ever going to ride a Deadwood stage again, or listen to the coyotes by night, or watch them brand a maverick in a dusty corral—from a safe seat on the fence. And if I ever see those great rock faces on Rushmore cliff, I'll be looking far beyond them to certain filmy faces of the past who peopled the prairie for me in my youth. They never realized what mighty farm forces they engendered.

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West: Department of Visual Education, University of California, Berkeley 4, California.
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IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of loan.

Request bookings from your nearest distributor.

A middle-aged Negro woman sat crying on the steps of the county court house.

"Why, aunty, what's the matter?" asked a passing white man.

Between sobs and sniffles she spoke. "Mistuh, my ol' man's done divo'ced me. An' dat ain't all—de jedge done give him all three children. An' dat ain't all—weren't none of 'em his chillun, anyhow."

* * *

A farmer posted a sign on the entrance of his premises which read: "No huntin, no fishin, no nothin."

* * *

Lecturer: "Can anyone give the derivation of the word 'Auditorium'?"

Listener: "Yes, from the word AUDO—to hear, and TARIUS—bull. A place where you. . . ."

Lecturer: "That will do."

* * *

He: "Do you smoke?"
She: "No, I don't smoke."
He: "Do you drink?"
She: "No, I don't drink?"
He: "Do you neck?"
She: "No, I don't neck."
He: "Well, then what do you do?"
She: "I tell lies."

* * *

Little Louise: "Mother dear, what does dehydrate mean?"

Mother: "It means getting all the water out of anything. Why?"

Little Louise: "Well, my puppy just dehydrated in the living room."

When the teacher asked little Johnnie how he enjoyed Easter Sunday, he came across with the following tale: "Pop and Mom painted some real pretty Easter eggs for Sis and me, and then hid them in the hen house so we couldn't find them. About that time, Joe, our rooster, came along and took one look, dashed over the fence into the next yard and kicked the heck out of the peacock over there."

* * *

Rastus: "Where are ya goin', boy?"

Sambo: "I's goin' down to git myself some tuberculosis stamps."

Rastus: "What is dey? I ain't never heard tell of em."

Sambo: "Every year I gits myself fifty cents worth of dem tuberculosis stamps an' stick dem on mah chest an' I ain't neber had tuberculosis yet."

* * *

Visitor: "Where's your daddy, Sonya?"

Sonya (age 4): "He's out in a gawage, fitsin' the dam car."

* * *

Man to his wife at the zoo: "Where are the monkeys?"

Wife: "Probably inside making love."

Man: "Would they come out for peanuts?"

Wife: "Would you?"

* * *

Two old ladies were discussing their physical ailments. Said one: "So your trouble is constipation. What do you take?" Said the other: "I just take my knitting."

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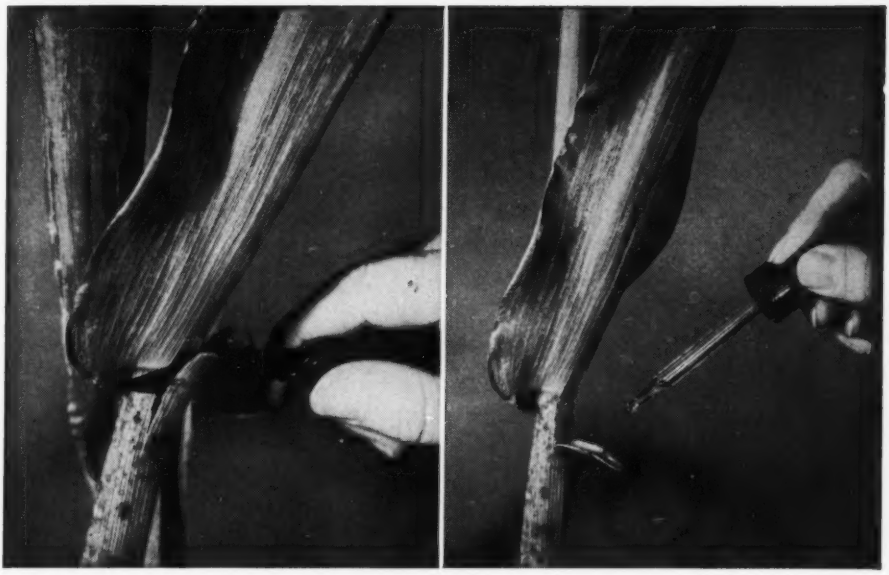

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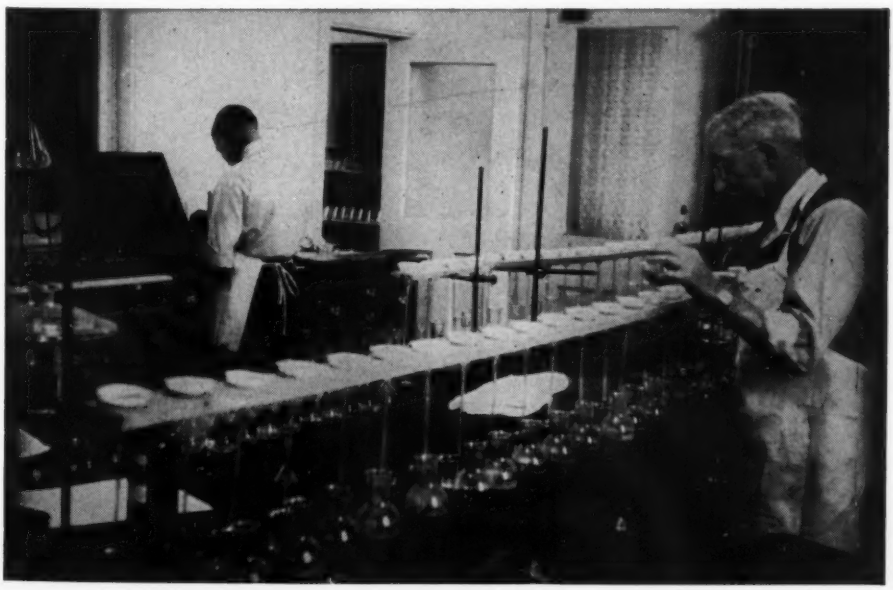

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